
BRINGING
RESEARCH
TO FARMERS
Nebraska
CornBoard
2025 Research Report


N276AT

2025 ANNUAL RESEARCH REPORT

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To learn more about the Nebraska Corn Board's research programs and initiatives, visit **nebraskacorn.gov.**

Water and Nutrient Management Focus Impact Today, for Tomorrow

As Nebraska corn farmers, we know every decision in the field counts. Water and nutrients aren't just inputs, they are critical resources that affect yield, soil health and long-term sustainability. That's why our research programming focuses on helping farmers use these resources more efficiently and productively on our farms.

Over the past several years, the Nebraska Corn Research and Stewardship Committee has explored several innovative strategies in irrigation and nutrient management. Trials on subsoil wood carbon injections, precision nitrogen applications and sensor-based irrigation have delivered encouraging results, including 15 to 20% improvements in nitrogen-usee efficiency (see page 11). These strategies improve crop performance and help protect soil and water resources for future generations.

Building on real-world research, the On-Farm Research Network has conducted more than 100 on-farm studies across Nebraska in the 2024 season, involving 35 Nebraska Extension team members and dozens of producers (see page 16). These funded programs tested practical strategies you and I use directly on our farms, providing guidance for irrigation timing, fertilizer application and soil carbon management. Recent results from the On-Farm Research Network demonstrate measurable returns. Producers report an average value of $15 per acre from knowledge gained, while advisors note nearly $10 million in cumulative impact, showing that research translates into true value.

Through collaborations with organizations like the University of Nebraska-Lincoln and the On-Farm Research Network, these initiatives give farmers tools to manage inputs smarter and more sustainably. By focusing on water and nutrient management today, we are not just improving this season's crop, we are investing in the future of Nebraska farms and the next generation of farmers.

We're glad to share this newsletter with you and hope you find it interesting and helpful. If you're curious or want to get involved with our research, don't hesitate to get in touch. Working together, we can continue driving innovation in Nebraska's corn industry.

Brandon Hunnicutt

Nebraska Corn Board District 3

Nebraska Corn Research Chair

ROI and Farmer Impact Focus Driving Value for Nebraska Farmers

Every dollar invested by Nebraska Corn in research needs to deliver real value for farmers. That's why we focus on projects and programs that improve profitability, efficiency and sustainability. From nutrient and irrigation management to pest control, crop performance and new uses for corn, each initiative is designed to produce tangible benefits.

We have been looking at western corn rootworm as it costs Nebraska nearly $1 billion annually in lost corn production. By effectively controlling rootworm larvae through native entomopathogenic nematodes, farmers may see measurable protection of yield, translating into increased revenue and reduced crop loss. That's a win for all of us as we tackle yield protection.

Our communities are also impacted. Nearly 97,000 elementary students have participated in educational outreach programs, including Ag Literacy Festivals, helping the next generation understand the importance of agriculture in Nebraska.

These projects also help farmers make better decisions, adopt new technologies and reduce input costs without sacrificing yield. Research strengthens communities by fostering collaboration and supporting local economies. Testing new tools, strategies and management approaches gives farmers innovations that make operations more efficient, resilient and profitable.

Transparency is key to the process. Every project is selected by farmers across Nebraska, ensuring programs reflect the diverse needs of producers from the panhandle to the eastern edge of the state. The result is research that benefits both individual farms and the broader industry, building a foundation for long-term growth and sustainability.

By investing in research today, we are creating tools, knowledge and practices that will pay dividends for years to come for farmers, communities and Nebraska's corn industry.

Jason Lewis

Nebraska Corn Growers Association State Representative

Nebraska Corn Research Vice Chair

Project Andromeda

RESEARCH TEAM | Bluestem Biosciences
FUNDING AWARDED | $100,000

PROJECT DURATION
December 2024–June 2025

Bluestem Biosciences Logo

Research Conducted

Bluestem Biosciences is a Nebraska-based startup founded in 2022 that develops yeast to produce industrial chemicals from corn. They aim to reduce carbon emissions, reshape supply chains and support rural economies in the Midwest by retrofitting current ethanol plants for chemical production. This project focused on selecting an industrial yeast strain that can tolerate high levels of 3-hydroxypropionic acid (3-HP), a chemical building block used in the production of plastics, coatings and adhesives. The main challenge is that most yeast strains cannot tolerate the levels of 3-HP required for cost-effective production. Bluestem set out to find and engineer a yeast strain that survives under these conditions and meets commercial production goals. The team tested numerous yeast strains, applied genetic engineering and developed fermentation methods to improve performance.

Findings and Recommendations

From this project, the team was able to successfully select a yeast strain far more tolerant to 3-HP than standard laboratory strains and is well suited for further development. Two rounds of genetic improvements allowed this yeast to reach a significant fraction of the target production level of 3-HP, demonstrating real progress. While not yet at full scale, this shows the industrial strain is on track. Both the yeast strain and fermentation process used here are under continued development.

Impact

The results of this project show that bio-based production of 3-HP is within reach. If successful, this process would provide a U.S. supply of bio-based acrylic acid and create a new market for corn. By demonstrating that an industrial yeast strain can both tolerate and produce 3-HP at high levels, this project moves the technology much closer to real-world use.

For Nebraska, this represents an opportunity to diversify the agricultural economy by linking crop production to advanced biomanufacturing. Nationally, the impact could be significant, providing a domestic source of acrylic acid and reducing reliance on fossil fuels.

Future Objectives

The next steps are to continue improving the yeast strain to push production of 3-HP to full commercial levels. This will include more rounds of genetic engineering and refining fermentation methods. In the longer term, the goal is to establish a cost-effective, fully renewable process for making 3-HP. Achieving this will strengthen Nebraska's role in industrial biotechnology, create new opportunities for farmers and support the broader shift toward sustainable, bio-based products.

Improving Sugar and Oil Yields from Corn via Heat-Activated Enzymes

RESEARCH TEAM | Dr. Nicole Buan (UNL)
FUNDING AWARDED | $100,042

PROJECT DURATION
July 2024–June 2025

Research Conducted

This project develops corn lines that "self-process" during standard heat steps in ethanol and biorefining, releasing more fermentable sugar and oil with less water and added enzymes. Goals of this work centered on (a) characterizing corn strains engineered to make heat-activated, lignocellulose-degrading enzymes; (b) improving sugar release through enzyme engineering; and (c) testing enzyme stability under tough, real-world bioprocess conditions. The overall aim is to raise value per bushel and reduce water use so processors can make more fuel and chemicals from the same grain.

Findings and Recommendations

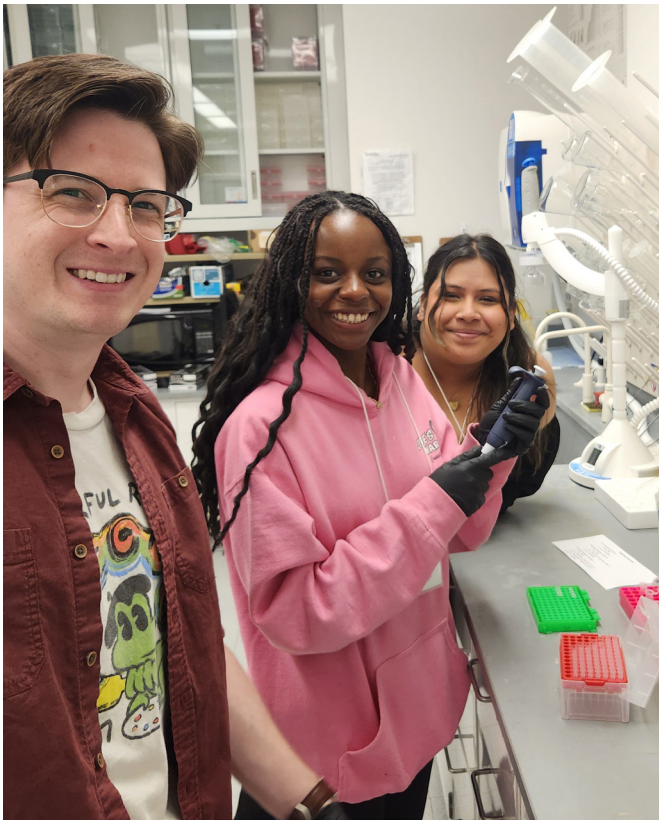
The team produced high-yield corn lines that release up to 7.5 times more sugar per kernel, identified additional enzyme candidates to strengthen the self-digesting trait further and showed that process-water recycling is feasible in ethanol biorefining. Together, these outcomes point to lower refinery costs (less purchased enzyme and energy), higher plant profitability (better lignocellulosic fuel scores) and lower water use, while maintaining distillers grains supply for cattle. For growers, the practical takeaway is the potential to plant higher-value corn lines targeted at biorefinery markets. For processors, recommended next steps include piloting these lines in commercial grind streams, validating enzyme performance at scale and quantifying cost and water savings across full production runs.

Impact

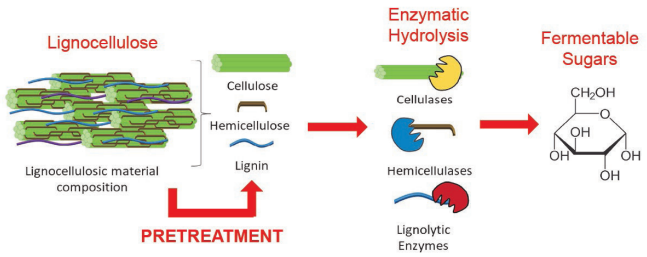
If this technology is adopted, Nebraska farmers could access premium markets for biorefinery-preferred corn, ethanol plants could make more gallons and co-product value per bushel with less water and livestock producers would continue to receive distillers grains. At the industry level, the technology supports growth in ethanol, sustainable aviation fuel and bio-based chemicals, positioning Nebraska to capture value as buyers and policies reward lower-carbon, water-smart production.

Future Objectives

Planned work includes optimizing the enzyme combinations in elite hybrids, field-scale validation with processing partners and side-by-side plant trials to document sugar/oil yield gains, enzyme savings and water-recycling performance. Additional outreach will share agronomic and marketing guidance so interested producers and processors can evaluate fit and return on investment.



Buan Lab grad student Connor Hines shows high school students from Omaha how we use enzymes in molecular biology research.



Process of converting plant material into simple sugars by breaking it down with pretreatment and specialized enzymes

Corn-to-VAM: Advancing a Corn-Based Vinyl Acetate Monomer Pathway

RESEARCH TEAM | Alex Buck, PhD, PMP (Iowa Corn; project lead)
FUNDING AWARDED | $75,000

PROJECT DURATION
September 2024–August 2025

Contractor

AVN Corporation serves as the contractor for this project.

www.avncorp.com

Vinyl acetate monomer is a building block for common products including foams that go into boogie board, crocs and flip flops.

Research Conducted

This project is developing a new way to make vinyl acetate monomer (VAM), a key ingredient in products such as shoes, foams, packaging and adhesives, using corn instead of petroleum. The goal is to create a cleaner, renewable process that adds value to corn while lowering the carbon footprint of materials used in everyday goods. The process centers on two main steps. First, monoethylene glycol (MEG) reacts with acetic acid in a tall distillation column to form an intermediate compound. Then, the intermediate is "cracked," or broken down, to produce VAM. The advantage of this approach is flexibility: MEG can come from either petroleum or corn-based sources, such as glucose or ethanol.

In the first year, the team confirmed that the computer model accurately predicts process performance, constructed a 25-foot (three-story) lab-scale reactive distillation column and successfully brought it online. The column performed better than expected, demonstrating high efficiency and consistent operation. Alongside technical progress, the team began outreach to potential partners and customers interested in sustainable, corn-based VAM for their manufacturing processes.

Findings and Recommendations

Three of four first-year milestones were achieved. The process model was validated, the new column was built and tested and early customer engagement began. One milestone was delayed due to fabrication timelines and will carry over into next year. Lab testing achieved over 80% selectivity in the key chemical step, an encouraging result that supports scaling up the process. The team is now using the column to run extended tests, fine-tune operating conditions and strengthen the process model to reflect real-world performance. This work builds on earlier progress in corn-derived MEG production. A related technology has been licensed to Technip Energies, and a separate commercial facility in Indiana is advancing another corn-to-MEG route. Together, these developments point to a reliable supply of bio-based MEG for use in the VAM process. The project team also began industry outreach through presentations and technical discussions, including a session at the Plant-Friendly Plastics Conference in March of 2025, helping educate chemical manufacturers on how modern corn production supports sustainability and innovation.

Impact

A successful corn-based route to VAM could open a new, large-scale market for corn that extends far beyond fuel or feed. Global VAM production is about 18.5 billion pounds per year, equivalent to roughly 500 million bushels of corn, and demand continues to rise. If this renewable process proves competitive at scale, it could generate steady, non-fuel demand for corn while offering manufacturers a cost-effective, lower-carbon alternative to petroleum feedstocks. The strong performance of the new distillation column and early engagement from potential customers provide confidence that the technology can move toward pilot-scale testing. Ultimately, this work could attract investment and create new opportunities for ethanol producers, MEG suppliers and growers across Nebraska and other corn-producing states.

Future Objectives

The next phase will focus on completing the remaining milestone for the enhanced column and running extended campaigns to verify yields and selectivity under plant-like conditions. The team will also continue working with industry partners to evaluate bio-based VAM in end-use products and to refine the technical and economic plans for a pilot or demonstration facility located near existing ethanol or MEG production sites. Outreach and education will continue through conferences and industry meetings to expand awareness and address misconceptions about corn sustainability. Together, these efforts will help confirm that a corn-enabled VAM process can deliver real environmental and economic benefits, creating new opportunities for farmers, industry partners and the broader bio-based materials sector.

WHAT'S NEW?

Enhanced column online: The custom 25-foot reactive distillation unit is operational and exceeding expected tray efficiency, enabling more rigorous validation and new test opportunities. One milestone moves to Year 2 due to fabrication delays.

Radicle Corn Value Chain Challenge

RESEARCH TEAM | Chris Bengtson (Iowa Corn), Radicle Insights
FUNDING AWARDED | $25,000

PROJECT DURATION
March 2024 –October 2024

Program Conducted

The Radicle Corn Value Chain Challenge launched its first competition in October 2024 to accelerate the development of new corn-based markets. The Challenge is a global competition designed to identify, invest in and support early-stage companies that can create innovative high-value uses for corn beyond traditional feed and fuel markets.

After a thorough review and judging process, two companies were selected as winners and received equity investments: Läkril Technologies, which converts corn ethanol into bio-based acrylic acid, and New Iridium, which uses photocatalysis to produce acetic acid from corn ethanol. Each company received a $750,000 investment, with Radicle providing ongoing support, including board participation and strategic guidance.

Outcomes

Läkril Technologies (First Place). Läkril developed a catalyst that converts corn ethanol into bio-based acrylic acid, offering a renewable lower-carbon alternative to petroleum-derived materials. The acrylic acid market is valued at approximately $11 billion and is growing 4–6% per year. If production were to shift to ethanol-based routes, it could generate up to 700 million bushels of corn demand annually. Läkril is advancing governance and scale-up efforts, including hiring a chief executive officer (CEO) to complement the founding CEO's technical and operational leadership and completing a $3.2 million seed funding round to support growth.

New Iridium (Second Place). New Iridium's photocatalysis platform enables low-cost, sustainable production of acetic acid from plant-based carbon dioxide (CO^2) using corn ethanol as a feedstock. The acetic acid market is estimated at $13–16 billion and is growing 7–8% annually. A global transition to bio-based acetic acid and ethyl acetate could create up to 2.2 billion bushels of corn demand each year. Upcoming goals include scaling manufacturing to produce customer samples by year end, working with a former chemical-industry CEO as a strategic advisor, achieving United States Department of Agriculture (USDA) BioPreferred® certification and completing a $2.65 million seed round. The company is also partnering with corn-state organizations and ethanol producers to plan early commercial pilot projects.

Impact

By selecting and funding two innovative chemistry platforms that convert corn ethanol into high-value chemicals, the Challenge expands corn demand beyond fuel and opens new downstream markets for growers. If these bio-based routes scale as projected, potential corn use for acrylic acid and acetic acid production could reach hundreds of millions to billions of bushels annually. These technologies also deliver lower-carbon products to industries such as chemicals, plastics, pharmaceuticals, agrochemicals and energy.

The Challenge model, combining capital investment with multi-year strategic support, board involvement and industry connections, helps ensure that winning companies can advance from laboratory to commercial scale. This structure accelerates progress toward customer validation, follow-on investment and potential long-term partnerships with ethanol producers and bio-based chemical suppliers.

Future Objectives

Radicle and its state corn partners will continue supporting both companies after investment. For Läkril Technologies, next steps include finalizing the CEO hire, expanding partnerships and executing scale-up plans funded by the recent seed round. For New Iridium, priorities include completing manufacturing scale-up, delivering customer samples, strengthening business development with support from the strategic advisor and advancing BioPreferred-aligned market-entry plans. Both teams will continue coordination with corn-state organizations and ethanol facilities to design pilot projects.

Läkril (first-place winner) presents their technology at the Radicle Challenge pitch day in San Francisco, CA.

New Iridium (second-place winner) presents their technology at the Radicle Challenge pitch day in San Francisco, CA.

WHAT'S NEW?

Planning for a second Radicle Corn Value Chain Challenge is underway for 2026! This competition seeks to highlight "healthy" technologies that are creating real demand in the near term.

Creation, Validation and Implementation of a Universal "Green/Sustainable" Index for Beef

RESEARCH TEAM | Dr. Elliott Dennis, Dr. Mike Boehm, Greg Ibach, Dr. Galen Erickson, Dr. Dick Perrin, Dr. Lilyan Fulginiti (UNL)
FUNDING AWARDED | $50,000

PROJECT DURATION
July 2022–June 2025

Research Conducted

Co-supported by the Nebraska Soybean Board, Nebraska Farm Bureau, Nebraska Ethanol Board and Nebraska Beef Council, this project is building a practical, third party–verifiable sustainability index for beef. The index is designed as a simple score producers can use to show environmental performance, social responsibility and economic viability. The research team is (1) comparing existing beef-related indices, (2) creating a universal "green index," (3) developing a supply-chain validation system with an independent auditing firm and (4) surveying consumers on which sustainability claims matter. To ground the index in real Nebraska conditions, the research team estimated the carbon intensity (CI), emissions per unit of product of key feedstuffs (corn, soybeans, distillers grains, soybean meal), at three Nebraska locations using United States Department of Agriculture's (USDA) Integrated Farm System Model (IFSM) and the GREET model. The research team then used IFSM, BEEF GEMs (USDA) and Holos (Canada) to estimate the carbon footprint of finished cattle fed those diets and compared model outputs to feedlot trial data from the University of Nebraska–Lincoln. The goal is a Nebraska-tested, auditable scoring method that can be used locally and could become a leading benchmark for responsible beef.

Findings and Recommendations

Nebraska feedstuffs are competitive on carbon. Average CIs for corn and soybeans were at or below U.S. defaults under common reduced-tillage practices. CI varied by region, irrigation and processing. Notably, drying distillers grains raised CI by about 50% compared with wet forms, while irrigated grain inputs often showed ~10% lower CI in the scenarios tested, largely due to higher yields spreading fixed emissions over more grain.

Beef footprints depend on diet and model. Across the three models, total feedlot emissions were in the same ballpark, translating to roughly 4–6 kg CO_2e per kg of body-weight gain. Models differed on where emissions show up (for example, enteric methane versus manure and upstream sources). IFSM tracked measured methane most closely; Holos estimated higher methane but lower land/manure/upstream emissions, giving it the lowest total in these comparisons. Sensitivity checks showed protein feeding level strongly affects IFSM's footprint, days on feed mattered most in BEEF GEMs and Holos and cattle numbers and feed efficiency influenced all models.

What this means on the ground: Producers can lower their index score (lower = better CI) by choosing lower-CI inputs (e.g., use wet distillers when practical), continuing reduced tillage/soil-health practices, right-sizing protein in rations, improving feed efficiency and avoiding unnecessary days on feed. For packers and programs that require documentation, an audited, Nebraska-specific index tied to real diets and practices provides a clear path to qualify and to be recognized for improvements.

Region		Corn		Soybeans	
		IFSM	GREET	IFSM	GREET
		----------lb CO_2e/lb of grain DM----------			
East					
	Rainfed	0.320	0.256	0.310	0.329
	Irrigated	0.280	0.242	0.270	0.307
Central					
	Rainfed	0.280	0.311	0.300	0.418
	Irrigated	0.270	0.245	0.250	0.307
West					
	Rainfed	0.370	0.335	-	-
	Irrigated	0.280	0.252	0.340	0.329
Nebraska averages*					
	Rainfed	0.314	0.267	0.309	0.336
	Irrigated	0.276	0.244	0.263	0.307
	weighted avg.	0.290	0.252	0.284	0.321

*IFSM entries are the averages of CIs recorded using individual weather years from 2014 to 2023. GREET entries used averages of 2014 to 2023 yields. *Share weighted averages using shares from recent NASS production.*

Impact

This work turns "sustainability" into clear numbers that producers, feeders, packers and buyers can use. A Nebraska-built and third party–audited index supports credible marketing claims and positions Nebraska beef to capture value in low-carbon and premium markets (including programs that reference CI under federal incentives). By quantifying how region, irrigation, tillage, co-products, ration formulation, feed efficiency and days on feed affect CI, the project shows where improvements pay and how to communicate them simply, helping producers make informed decisions, attract investment and meet customer expectations without guesswork.

Future Objectives

Next, the research team plans to test how carbon-reduction payments influence crop and nutrient decisions, especially nitrogen. Early results suggest that lowering emissions can sometimes lower yields. The research team will continue to assess how existing carbon models respond to different N-management strategies and estimate what payment levels are needed to fairly offset changes in inputs or returns when adopting new practices.

Impact of Frequency of Variation in Distillers in Feedlot Diets on Performance

RESEARCH TEAM | Dr. Galen Erickson, Dr. James MacDonald, Dr. Keara O'Reilly (UNL)
FUNDING AWARDED | $73,693

PROJECT DURATION
July 2023–June 2025

Research Conducted

Distillers grains are critically important to Nebraska by adding value to the corn, ethanol and cattle industries. The cattle-feeding sector has challenges in managing variation in supply and deliveries of distillers grains. The objective of this study was to determine how the frequency of changing inclusion of modified distillers grains plus solubles throughout the feeding period impacts feedlot performance and carcass characteristics. Evaluation can occur of cattle fed individually by controlling bunk access at the new University of Nebraska Klopfenstein Feeding Technology Center near Mead, Neb. The study used 229 steers whereby cattle are housed in eight pens but individually fed using the Insentec system. Using new electronic bunks, individual animal intakes and eating behavior were evaluated for cattle fed five approaches: a corn control (no distillers), 25% distillers grains kept at a constant inclusion and an average of 25% but varying from 15 to 35% with variation imposed daily, weekly or monthly. Treatments with varying distillers inclusion had inclusions chosen randomly of 15, 20, 25, 30 and 35% dietary inclusion of distillers. At the end of the feeding period, cattle were sent to market to determine their carcass characteristics.

Findings and Recommendations

The results of this study follow similar trends as the previous two studies published in the University of Nebraska–Lincoln 2024 and 2025 Nebraska Beef Cattle Research Reports looking into the impacts of varying distillers grains in feedlot diets. Feeding modified distillers at 25% (constant and varying inclusion treatments) increased average daily gain, carcass and final body weight and improved feed conversions because intakes were not impacted, which is a common response. In terms of varying the inclusions of distillers grains in feedlot diets, there were no large impacts on intake, gain and out weights whether inclusions varied daily, weekly or monthly. Intakes were not impacted by varying distillers, which was surprising. For the steers on the daily and monthly varying treatments, there was no difference in average daily gain or out weights compared to consistently distillers-fed cattle, but there was a tendency for cattle whose variations changed weekly to gain less than the cattle fed a constant inclusion.

Feed conversions were impacted by treatments whereby cattle fed distillers in any manner had better conversions (less feed per pound of gain). The exception was cattle fed distillers that varied on a weekly frequency were statistically similar to cattle not fed distillers and worse than cattle fed a constant amount of distillers each day. Looking at the treatments, cattle fed distillers consistently at 25% in the diet did have numerically the best gain, greatest out weights and best conversions, while the cattle fed the varying inclusions were similar and the cattle not fed any distillers were consistently lower in gain and out weight and had the greatest conversions.

Impact

In previous studies showing value of distillers grains for finishing cattle, inclusion of distillers was purposely kept constant to show how much energy distillers have relative to corn and the economic opportunity to feed distillers. Given this study shows that varying inclusion of distillers grains were not very detrimental to cattle performance, and certainly less disruptive than previously thought, then feeders may embrace small supply fluctuations and not avoid use of distillers. The results are very useful to consulting nutritionists, cattle feeders and ethanol plants to better align supply and demand required throughout the cattle-feeding period.

Future Objectives

The results of the study will be published in the Nebraska Beef Report and published in a peer-reviewed journal in future years. It will be discussed and presented with consultants and beef producers at the Feedlot Roundtables, Husker Nutrition Conference and Plains Nutrition Council Spring Conference.

WHAT'S NEW?

Study results should motivate the beef industry feeding sector to sustain and increase the use of distillers grains, rather than reducing use in response to minor supply fluctuations.

Masters student Paige Madison with her favorite steer on trial, Henry.

Insentec by Hokafarm individual animal feeding bunks in open position prior to feeding.

Inserting ruminal pH probes into steers.

Wood Carbon Subsoil Amendment for Sustainable Corn Production on Sandy Irrigated Soils

RESEARCH TEAM | Dr. Daniel D. Snow, Dr. Arindam Malakar, Dr. Aaron Daigh, Dr. Daniel Miller, Xiaochen Dong (UNL)
FUNDING AWARDED | $41,472

PROJECT DURATION
July 2023–June 2025

Research Conducted

Producers operating under irrigated, sandy, well-drained soils with low water-holding capacity have few cost-effective solutions to manage nutrient losses. This project seeks to demonstrate how subsoil wood carbon injection can be used to control nitrate leaching while also providing a means for directly increasing soil carbon content using finely ground wood chips. For this project, modified farm equipment was used to inject and sequester wood carbon while stimulating nitrate reduction below the crop root zone in two irrigated corn test plots in northeast Nebraska near Creighton during the 2024 season. The two research sites received similar amounts of irrigation and fertilizer application rates but differed in source and application methods. Soil types differed significantly, ranging from a clay-silt loam soil to a very well-drained sandy loam.

Findings and Recommendations

Soil nitrate-N concentrations showed a systematic reduction in concentrations (about 15 to 20%) beneath treated plots as compared to adjacent tilled plots without wood chips. The statistical significance in nitrate reduction between the treated and untreated areas was low because of the high variability in measured soil nitrate between subplots. Spatial variability of the injected wood contributed to high variability in carbon, total nitrogen and nitrate levels. Samples from the wood-chip layer had a greater abundance of denitrifying bacteria in the wood-chip plots compared to the control plots, indicating that the nitrate-consuming bacteria likely grew as a result of the injected wood carbon.

Impact

The use of subsoil waste wood carbon injection could provide a cost-effective (about $30 per acre) alternative practice for controlling nitrate leaching beneath irrigated corn on sandy, well-drained soils. Subsoil waste wood injection can enhance the soil's capacity for carbon sequestration. The Nebraska Forest Service estimates the supply of waste wood available for fuel and similar purposes at more than 270,000 tons. Burning this biomass does not offer the carbon sequestration credit that subsoil injections can provide. The project is expected to lead to a novel management practice for improving Nebraska's groundwater quality by controlling nitrate leaching under irrigated cropland while simultaneously increasing sequestration of soil carbon.

A feeder hopper and auger attached to a drop chute installed on a subsoil plow shank provided the means to inject 1500 lb/acre of locally sourced waste wood at a 14-inch depth.

WHAT'S NEW?

Depths below the injection zone showed lower concentrations of nitrate in the vadose zone profile compared to the control at the western location with higher sand content.

Future Objectives

Ongoing analyses, including bromide tracer movement and microbial community characterization, will help clarify the mechanisms driving nitrate reduction following subsurface wood carbon injection. Additional simulation modeling across different soil types will further quantify nitrate leaching potential and economic feasibility under varied conditions. These efforts aim to establish both the environmental and financial viability of using finely ground wood carbon to reduce nitrate losses beneath irrigated sandy soils.

The project will generate sufficient data to support at least two peer-reviewed research publications and serve as a foundation for refining this emerging management practice. Results and recommendations will be shared through the Bazile Groundwater Management Area field days, the Nebraska Association of Resources Districts Water Programs meeting and other key outreach events to encourage adoption and collaboration among producers, researchers and resource managers.

Piloting the Nebraska Nitrogen Initiative

RESEARCH TEAM | Dr. James Schnable (UNL), Adam Leise (Nebraska Extension), with support from Nebraska On-Farm Research Network, TAPS and University of Nebraska research staff

FUNDING AWARDED | $113,238

PROJECT DURATION
February 2025–May 2026

Research Conducted

Nitrogen fertilizer is one of the largest costs in corn production, yet the "right rate" can vary dramatically by field, year and management. Without precise local data, farmers risk applying more than necessary—spending extra dollars with little return and increasing the chance of nutrient loss. To address this challenge, Nebraska has launched the Nebraska Nitrogen Initiative, a statewide effort to refine nitrogen recommendations based on local, on-farm data. The goal is simple: give farmers reliable, Nebraska-specific numbers to guide nitrogen decisions and boost profitability while protecting natural resources.

The project is built around variable nitrogen-rate trials conducted across Nebraska. Each trial tests four to eight nitrogen rates on one-acre plots, with cooperating farmers applying prescriptions tailored to their equipment and management. Working through Nebraska Extension's On-Farm Research Network, farmers receive custom nitrogen plans, and data are collected on yield, soil fertility, weather and cropping practices. These results are carefully analyzed to determine the most profitable rates for each scenario and to build a statewide dataset that reflects Nebraska's diverse soils and growing conditions.

This work also benefits from a partnership with the Iowa Nitrogen Initiative, which has conducted more than 1,500 trials since 2022. While Nebraska's effort is independently designed and focused on its own production systems, the collaboration strengthens the project by enabling data to be compared and combined across states. Together, these initiatives are creating a robust database that will eventually power predictive models and AI tools capable of tailoring nitrogen recommendations by field and season.

Locations of historical nitrogen-trial experiments in the NOFR database. (Photo credit: Hadiya Kounsar)

Findings and Recommendations

Although still in its pilot stage, the Nebraska Nitrogen Initiative is already generating meaningful results. Over the 2025 growing season, ten field trials were carried out across Nebraska's varied soils and management systems, and more than forty data points were recovered from past and ongoing research. This combination of new and historic information brings fresh value to earlier studies while building the foundation of Nebraska's first statewide nitrogen database.

A major outcome of the pilot has been the establishment of a grower support network that connects farmers directly with extension specialists and technical support staff. At the same time, the project has developed a standardized workflow to collect, clean and store aggregated trial data. These systems ensure that results are reliable, comparable across sites and readily usable for both farmers and advisors.

The pilot has also demonstrated the strength of Nebraska's on-farm approach: trials are diverse in geography, management style and application timing, making the findings widely applicable. Early analyses already point to differences in nitrogen response tied to soil type, rainfall and management practices, giving farmers their first look at how site-specific data can directly influence fertilizer decisions.

Impact

For Nebraska growers, this project represents a shift to local, evidence-based decisions. Farmers will benefit from knowing how soils and weather affect crop needs in their own regions, allowing them to save money on fertilizer while maintaining strong yields. More precise nitrogen management will also help protect water quality by reducing excess nitrogen applications and prepare farmers for potential regulations tied to nitrate or greenhouse-gas emissions.

Beyond individual farm benefits, the project also strengthens the farmer–researcher partnership model. Nebraska's On-Farm Research Network is at the root of this effort, and participating farmers gain valuable insights for their own operations while contributing to a statewide dataset that benefits agriculture as a whole.

Future Objectives

The vision is to build a lasting, farmer-driven research network across Nebraska that equips producers with the best nitrogen science available. This pilot sets the stage for expanded research, greater farmer involvement and increasingly precise recommendations. As more partners, such as state agencies, commodity groups and private industry join the effort, the network of cooperating farms will continue to grow.

Over time, the expanded dataset will allow researchers to develop powerful, easy-to-use predictive tools that provide nitrogen recommendations tailored to each field and each season. By scaling the project to hundreds of farms, the initiative will deliver insights that increase profitability, improve efficiency and safeguard natural resources.

Improving UNL Nitrogen Algorithm with the 4Rs Nitrogen Management

RESEARCH TEAM | Dr. Javed Iqbal, Dr. Joe Luck, Dr. Bijesh Maharjan (UNL)
FUNDING AWARDED | $95,975

PROJECT DURATION
July 2022–June 2025

Research Conducted

The "4Rs" nutrient stewardship approach—right source, right place, right time and right rate, aims to enhance crop production, profitability and sustainability in agriculture. This project focuses on refining nitrogen (N) fertilization practices in Nebraska by evaluating the effects of four N sources (anhydrous ammonia, UAN, ESN and urea), two placement methods (broadcast and injected) and two timing options (pre-plant and split application) on corn yield and nitrogen losses below the root zone. Field trials were conducted at two sites with contrasting soil types. Data collection and analysis focused on corn yield, N-use efficiency, soil N retention and N losses through N_2O emissions, NO_2- leaching and NH_3 volatilization.

Findings and Recommendations

Preliminary results from the previous season indicate that split applications of UAN, particularly when broadcast on sandy soils, achieved high yields. Injecting UAN rather than broadcasting significantly reduced ammonia volatilization losses by up to 76%, and was more effective than polymer-coated urea in this regard. Across nitrogen sources, split application generally improved grain yield compared to pre-plant, with the largest gains observed when UAN was broadcast. Polymer-coated urea applied in split with UAN produced the highest yields among all treatments, highlighting its potential as a best management practice for sandy soils. However, split applications tended to have higher volatilization losses than pre-plant, except when UAN was injected, which reduced losses by fourfold relative to broadcast.

In terms of nitrate leaching, split nitrogen applications decreased losses by 43% compared to pre-plant for most sources (except anhydrous ammonia and urea), with injected UAN at pre-plant showing lower leaching than broadcast UAN. These findings support prioritizing injected nitrogen and split applications tailored to soil type and environmental conditions. Overall, implementing the 4Rs nutrient stewardship framework can enhance nitrogen-use efficiency, boost profitability and protect groundwater quality, offering a balanced approach to agronomic and environmental sustainability in sandy soil cropping systems.

Anmol Singh puts an ammonia trap in the field.

Anmol analyzes soil nitrogen in the Iqbal soil and water lab.

Impact

The implementation of the 4Rs framework provides substantial benefits to Nebraska's agricultural stakeholders by delivering research-based recommendations that improve crop yields while reducing nitrogen losses. This multi-year project aims to refine and update the University of Nebraska–Lincoln (UNL) nitrogen recommendations based on empirical data generated from field research. Outreach and extension efforts have been a key part of the project, with findings shared at events such as the Nebraska 4Rs Nutrient Stewardship Field Day and Crop Production Clinics. Collectively, these events have reached over 600 attendees, influencing management decisions across more than 8 million acres and contributing to an estimated knowledge value of $14 per acre.

WHAT'S NEW?

Adopting a nitrogen stabilizer with in-season nitrogen application can reduce nitrate leaching by 43% while maintaining high yields.

Future Objectives

For the third year of the study (2024–2025), data collection is ongoing and will be completed at the end of the growing season. Following completion, the full three-year dataset will be analyzed to produce three research manuscripts for submission to international peer-reviewed journals. Key findings will also be summarized and published in extension reports to ensure accessibility for producers and stakeholders. Ultimately, the results of this work will be incorporated into an updated version of the UNL Nitrogen Calculator, further enhancing decision-making tools for Nebraska farmers and supporting the long-term goals of sustainable and profitable corn production.

Corn Root Research for Smarter Hybrid and Nitrogen Management

RESEARCH TEAM | Dr. Guillermo Balboa, Dr. Joe Luck, Murilo Rampazzo (UNL, Digital Farming Lab) in partnership with Beck's Hybrids

FUNDING AWARDED | $84,000

PROJECT DURATION
April 2025–March 2026

Research Conducted

How deep your corn roots grow—and how your hybrid handles crowding—may be key to squeezing more yield from every pound of nitrogen (N). This project pairs digital agriculture tools with field trials to evaluate how root architecture (deep/vertical vs. shallow/horizontal) and ear type (flex vs. fixed) respond to seeding rate and N strategy, helping farmers fine-tune hybrid and management choices for greater efficiency. In 2025, three trials were implemented at the Eastern Nebraska Research, Extension and Education Center (ENREEC). Treatments included four hybrids (combinations of ear flex and root architecture), three seeding rates, and three N strategies: full pre-plant, split, and split with sensor-guided sidedress. At the South Central Agricultural Laboratory (SCAL), hybrids were evaluated across three seeding rates under both dryland and irrigated conditions.

A full-time master's student, funded by the project, works with the farm's operations team and technicians to implement treatments and collect data. Field measurements include drone-based multispectral imagery, stand counts, above-ground biomass, root biomass, grain yield and other traits. Root traits are quantified via deep soil coring and processed at UNL's root washing and scanning facility to measure root biomass, length and depth. The combination of seeding rate, N level and water regime (irrigated vs. dryland) will allow the team to characterize each hybrid's yield response and stability.

Findings and Recommendations

This project is underway in the 2025 growing season. By linking hybrid type, planting density and N management with both root and shoot data, the study is expected to reveal differences in hybrid stability and response across environments, and how root architecture drives those responses. A key focus is nitrogen efficiency: comparisons among full pre-plant, split applications and sensor-guided sidedress should indicate which program delivers the most yield per pound of N applied.

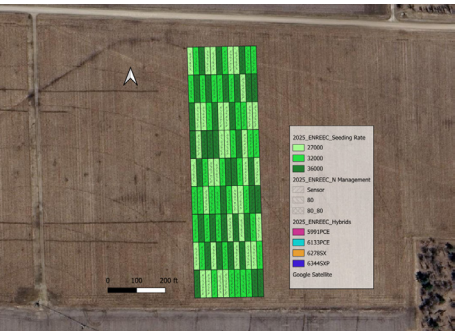
These results will support clearer recommendations for hybrid selection, seeding rates and N management. Digital outputs—prescription maps, multispectral imagery, yield maps and root-scan summaries—will be translated into practical decision aids for farmers.

Impact

This research connects the "hidden half" of the plant—its roots—to on-farm management decisions through digital agriculture tools. By combining root and shoot data with technologies such as prescription seeding, nitrogen mapping, yield monitoring and root scanning, the project clarifies how hybrids respond to seeding rate and nitrogen strategy under different conditions. These insights will help farmers match hybrids to specific environments, optimize seeding and fertilizer inputs and improve nitrogen efficiency to reduce costs and environmental losses.

Future Objectives

Looking ahead, the research team intends to broaden the study to additional dryland sites and environmental conditions, especially where water stress interacts with fertility. Continued work will refine the use of precision and digital agriculture for hybrid recommendations, seeding and nitrogen guidelines across Nebraska and the greater Corn Belt. Ultimately, the goal is to integrate root architecture into hybrid selection and management strategies, helping farmers stay resilient as production challenges and weather variability continue to evolve.



Picture 1: Experiment map at the ENREEC showing 36 treatments replicated three times (108 plots) as a combination of three seeding rates, three nitrogen strategies, and four corn hybrids. Digital agriculture tools can help design and implement complex experiments evaluating multiple factors with accuracy. Multispectral imagery and other data, such as the yield map, help to understand the interactions among the evaluated management practices, producing tailored recommendations for farmers. Picture 2: Aerial view of the ENREEC experiment site. The project is evaluating four Beck's Hybrids (with two root architectures), three seeding rates, and three Nitrogen management strategies. picture taken on August 11. Credits: Facundo Gilardoni, Certified Drone Pilot, Digital Farming Lab. Picture 3: Student from the Digital Farming Lab (Julio Masnello) operating one of the root washers at the Agronomy Greenhouse (East Campus). This state-of-the-art facility can process up to 50 samples per day. After recovering the roots, they are scanned and processed to measure root length, thickness and biomass. Analyzing these roots will contribute to a better understanding of root biomass and response to seeding rate, hybrid selection, nitrogen management and water environment (irrigated, dryland). The facility is part of the Digital Farming Lab Service Center at UNL. Right bottom corner shows roots recovered after washing a sample (1-foot by 2-inch core).

Genome to Fields (G2F): High Throughput and Conventional Phenotyping of Grower-Relevant Germplasm in Western and Eastern Nebraska

RESEARCH TEAM | Dr. James Schnable, Dr. Brandi Sigmon (UNL), Dr. Ravi Mural (SDSU)
FUNDING AWARDED | $59,214

PROJECT DURATION
Ongoing since July 2016

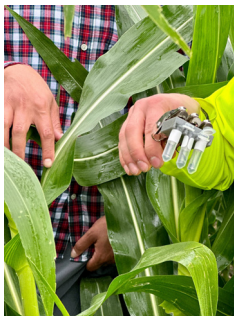
PhD students Harshita Mangal and Waqar Ali, members of the Schnable Lab at UNL, work with research technician Kyle Linders to lay out and double-check the organization of seed packets prior to planting.

Research Conducted

The Nebraska Genomes to Fields (Nebraska G2F) project evaluated about 250 corn hybrids derived primarily from recently off-patent breeding material across three Nebraska sites (Lincoln, North Platte irrigated and North Platte dryland), complemented by intensive phenotyping of 19 hybrids at the Spidercam facility in Mead, Nebraska. Standardized field data (phenology, yield components, lodging, etc.) and high-throughput sensor data (RGB, NIR, thermal, multispectral, LiDAR, UAV and satellite) were collected from each site, as well as detailed weather and soil data. All data were uploaded to CyVerse for consortium-wide access and integration with similar trials conducted across about 20 other U.S. states.

Findings and Recommendations

The information generated by Nebraska G2F and the nationwide consortium enabled at least 14 scientific publications spanning genomic prediction, AI-enabled breeding and crop physiology in the past year. Researchers at the University of Nebraska–Lincoln developed a new AI-based approach to measuring flowering



Members of the Schnable and Sahay Labs collect samples of corn leaves to measure both the expression of different genes and the abundance of antioxidants.

time from UAVs that required only two to three flights per season. They also improved and benchmarked approaches to track stay-green and drydown in small plots (two-row, 21-foot plots) using satellite data.

Impact

In concert with our collaborators across the G2F consortium, Nebraska G2F sites provide unique, public, multi-location datasets on corn performance at a scale comparable to private breeding programs. The Nebraska G2F sites also lower barriers for researchers lacking field capacity to enter corn field research, as seen by multiple projects and pilot efforts built on collecting data from our fields this summer. Training impacts included former G2F co-principal investigator Ravi Mural securing a tenure-track position at South Dakota State University, where he now contributes to corn genetics research and serves as the point of contact for integrating multi-state nitrogen-testing initiatives. The project also engages doctoral students working with hybrid corn field data whose projects would otherwise have been purely computational, lab or greenhouse focused.

Future Objectives

In the coming year, the Nebraska G2F project will continue testing new crop sensing and imaging technologies ranging from handheld and in-field tools to UAV and satellite platforms. These additions will enhance data collection across locations and improve the project's ability to link field observations with environmental and genetic information.

The team will also participate in the 2025 GxE Prediction Contest, which encourages researchers to develop better ways to predict how genetics, environment and management interact to affect yield. This initiative will provide an opportunity to explore new analytical approaches and engage collaborators from a range of research backgrounds, further supporting the goals of the Genomes to Fields network.

Genomes to Fields hybrid corn trials growing at UNL's Havelock farm northeast of Lincoln.

WHAT'S NEW?

UNLOCKING THE CORN GENOME FOR NEW USES

In 2024, The U.S. Department of Energy awarded more than $500,000 to measure the activity of every gene in corn across hundreds of Genomes to Fields (G2F) hybrids in six states. That data now underpins work with the Nebraska Food for Health Center to breed hybrids with unique pericarp fibers that may support gut health and open new markets.

SMARTER TOOLS FOR DISEASE SCORING

Scoring foliar disease is essential but inconsistent—different people often assign different severities to the same plant. In a year of widespread southern rust and tar spot, Schnable Lab researcher Jensina Davis, PhD, and technologist Jon Turkus are testing 3D-printed smartphone adapters (built at Nebraska Innovation Studio) to take standardized leaf photos for unbiased measurements and to map resistance genes across hundreds of hybrids.

Nebraska On-Farm Research Network

RESEARCH TEAM | Dr. Travis Prochaska, Adam Leise, Dr. Guillermo Balboa (UNL)
FUNDING AWARDED | $72,807

PROJECT DURATION
Ongoing since July 2014

Research Conducted

The Nebraska On-Farm Research Network (NOFRN) is a statewide program intended to address critical farmer production, profitability and sustainability questions. The network sought to answer these questions through collaboration with growers across the state. The NOFRN conducted 101 on-farm research studies in collaboration with 35 Nebraska Extension team members during the 2024 growing season. More than 115 projects are expected to be completed in 2025 across 37 Nebraska counties, including a range of topics such as irrigation scheduling, satellite imagery-based fertilizer management and drone fungicide applications.

Findings and Recommendations

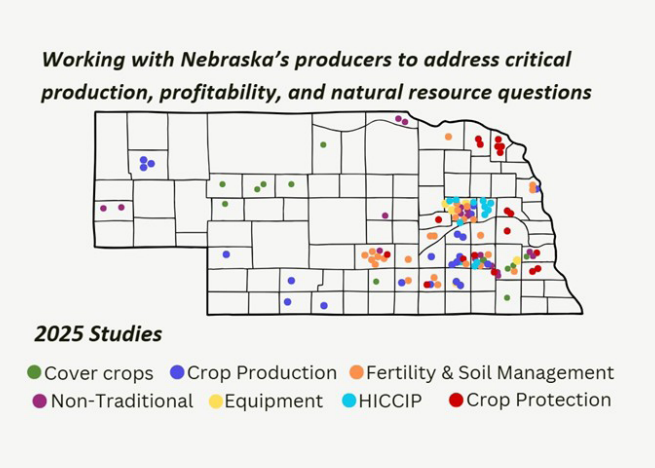
This report does not provide specific findings and recommendations from individual research studies because there are far too many to include. However, it highlights the network's dedication to addressing critical production, profitability and sustainability questions pertinent to Nebraska corn growers. The research team presented their findings and recommendations through various channels, including an annual report book, annual results update meetings and CropWatch articles. Additionally, they engaged in broader knowledge dissemination through publications, guest lectures, podcast interviews and media appearances.

Impact

The project's impact extended to both crop producers and advisors, who reported significant value from the research. Crop producers noted a value of $15 per acre of knowledge gained from the network, while advisors reported a value of nearly $10 million. Attendees at the annual results update meetings expressed appreciation for the opportunity to learn from other producers, access unbiased results and engage in discussions about on-farm research projects.

Future Objectives

The Nebraska On-Farm Research Network aims to continue providing growers with opportunities to use their resources to answer production-related questions and generate new discoveries. Looking forward, the network plans to continue recruiting producers and advisors, enhance digital and spatial data collection and processing, develop additional support tools and position itself as a nation leader, facilitate an interactive professional development network for corn producers and benefit corn farmers through a unified, collaborative research model for all crop commodity boards and associations.

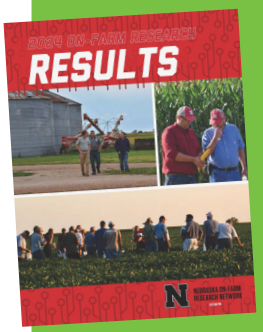


Map of 2025 Nebraska On-Farm Research Network studies categorized by seven research topics.

Corn planted green into grazed hairy vetch for a nitrogen rate on-farm research study monitored by Sentinel Ag.

"Very worthwhile research that I will use on my farm"

– NEBRASKA FARMER QUOTE



Over 600 copies of the peer-reviewed 2024 On-Farm Research Results book were distributed.

SCAN NOW
or visit on-farm-research.unl.edu

UNL Testing Ag Performance Solutions (TAPS)

RESEARCH TEAM | Dr. Chris Proctor, Chuck Burr, Aaron Nygren, Dr. Tamra Jackson-Ziems, Dr. Daren Redfearn, Dr. Julie Peterson, Dr. Mark Burbach, Dr. Jay Parsons, Dr. Matt Stockton, Dr. Milos Zaric, Dr. Nicolas Caforo La Menza, Dr. Abia Katimbo, Vinicus Velho, Dr. Javed Iqbal, Dr. Saleh Taghvaeian (UNL)

FUNDING AWARDED | $99,657

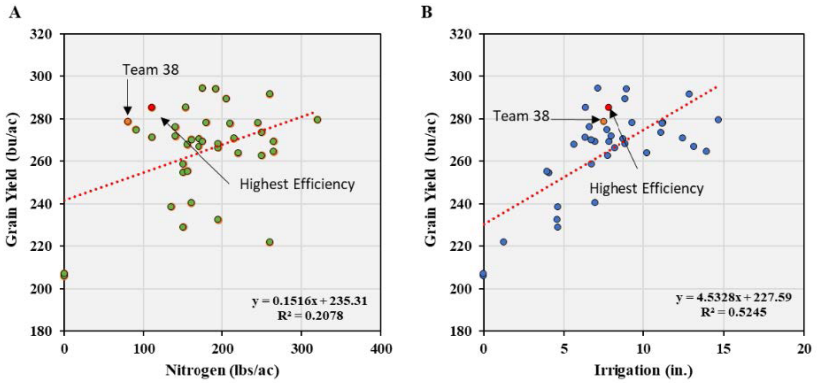
PROJECT DURATION
Ongoing since July 2021

Program Conducted

The Testing Ag Performance Solutions (TAPS) program provides farmers with a unique chance to experiment with farm-management strategies in a competitive but low-risk environment. Supported by over 90 partners, TAPS combines agronomic and economic decision-making, peer learning, and technology access to help producers improve efficiency and profitability. Competitions simulate real farming decisions in areas like crop insurance, hybrid and seeding rate selection, nitrogen and irrigation management and marketing. In 2024, events included sprinkler-irrigated corn, continuous corn, irrigated sorghum and irrigated soybeans. In 2025, TAPS expanded to 125 teams across six competitions, adding new industry-backed competitions focused on food-grade corn and nitrogen-source comparisons. Participants include producers, students, industry representatives and agency staff. Benchmark teams from biological and technology companies also competed adjacent to other competitions for comparison, especially around nitrogen-reduction practices. Outreach activities such as webinars, field days and kickoff events connect participants with soil-moisture sensor companies, crop specialists and other experts.

Outcomes

Key outcomes from the 2024 and 2025 seasons include nitrogen efficiency, technology adoption, decision-making and peer learning. Benchmark biological product teams ranked among the most efficient, suggesting that alternative nitrogen sources and biologicals could play a role in reducing inputs while maintaining yields. Twelve soil-moisture sensor companies participated in 2025, reflecting growing interest and the need for continued education to help farmers effectively use these tools. Competitions showed that the most efficient farms were not always the highest yielding, underscoring the importance of balancing inputs, profitability and resource stewardship. Farmer-to-farmer networking during field days and banquets provided valuable opportunities for producers to exchange experiences and build confidence in new management strategies.



Sprinkler corn grain yield response to seasonal total nitrogen fertilizer (A) and irrigation (B) at the WCREEC in North Platte, NE. The most efficient farm in TAPS competition measured by the Water Nitrogen Intensification Performance Index is denoted in red and Team 38 is denoted in orange.

Impact

The TAPS program continues to demonstrate measurable benefits for participants and Nebraska agriculture as a whole. Nearly 170 participants engaged in 2024, with 70% competing in corn contests. Importantly, TAPS provides a safe place for farmers to test nitrogen-reduction strategies and compare against peers, promoting adoption of practices that improve yields, efficiency and environmental outcomes. The competitions also strengthen industry partnerships, giving companies a real-world setting to evaluate products while exposing farmers to the latest innovations. Beyond agronomic results, published research shows that TAPS strengthens collaborative learning, increases farmer confidence in adopting new practices and supports whole-farm systems thinking. This integration of agronomy, economics and human decision-making makes TAPS unique.

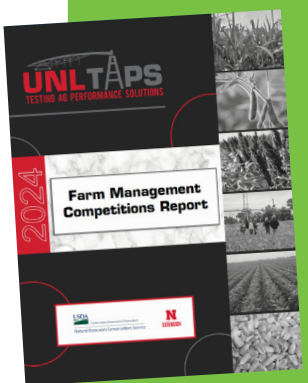
Future Objectives

Looking ahead, the University of Nebraska-Lincoln (UNL) TAPS plans to wrap up the 2025 competition with an awards banquet in January 2026 and continue building toward 2026 events in eastern and west-central Nebraska. Future objectives are to: (a) Plan competitions with a sharper focus on nitrogen efficiency to help address Nebraska's groundwater nitrate challenges. (b) Continue pursuing external funding, including a Foundation for Food and Agriculture Research grant proposal aimed at regional optimization of water and nitrogen use. (c) Analyze nearly a decade of TAPS data with a dedicated data analyst to uncover deeper economic insights for Nebraska farmers. (d) Strengthen technology and industry partnerships to provide participants access to cutting-edge tools and management approaches.

As these objectives are achieved, TAPS will maintain the program's focus on experiential, data-driven learning.

WHAT'S NEW?

UNL-TAPS MEDIA LIBRARY
Latest comprehensive reports, newsletters, tips and videos.



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or visit taps.unl.edu

Exploring Incentive-Program Participation with the Ag Budget Calculator (ABC)

RESEARCH TEAM | Dr. Jay Parson, Glennis McClure, Jessica Groskopf, Jeremy Eide (UNL)
FUNDING AWARDED | $14,840

PROJECT DURATION
January 2025–June 2025

Program Conducted

The aim of this Phase I proof-of-concept project was to explore how effectively the Agricultural Budget Calculator (ABC) tool provides a platform for Nebraska corn producers to analyze potential participation in environmental incentive programs. An existing Nebraska corn budget was modified to include production practice expenses and the associated incentive or cost-share payments from two specific conservation incentive programs. Four scenarios were analyzed and compared: (1) a baseline scenario with no incentive program; (2) participation in a private-sector cover crop incentive program; (3) participation in a public-sector nutrient management incentive program; and (4) a "stacked" scenario that combined both private- and public-sector programs. The objective was to demonstrate ABC's utility and limitations in capturing real-world incentive-program dynamics within a crop enterprise budget, as well as its ability to provide a user-friendly platform for producers to analyze participation decisions.

Outcomes

The ABC tool demonstrated basic capabilities to layer multiple incentive programs within a single crop enterprise. It also includes a comparison feature that allows users to compare enterprise budgets to a base scenario on an equivalent yield or price basis. However, there is currently no straightforward way to compare two budgets on a dollar-per-acre basis aside from printing and manually reviewing reports. This project identified six key enhancements that would significantly improve ABC's usefulness for evaluating conservation incentive programs: (1) enhancing the ability to add other income with custom labels; (2) simplifying the creation of multiple enterprise scenarios; (3) improving options for inserting notes and comments; (4) expanding side-by-side budget comparison tools; (5) adding partial budget-comparison capabilities; and (6) strengthening risk analysis of scenario comparisons.

Three educational and outreach events were held to share project outcomes and gather feedback. In March, a Center for Agricultural Profitability (CAP) noon-hour webinar titled "Analyzing the Profitability of Stacked Extended Crop Rotations for Soil Health Using the Agricultural Budget Calculator Program" was presented to 18 participants. Hosted by Glennis McClure, it featured a Nebraska producer who shared how he has used the ABC program to evaluate cropping scenarios that improved profitability with fewer inputs and higher revenues. In late August, an hour-long presentation and discussion with the Governor's Water Quality and Quantity Task Force Subcommittee on Financing and Incentives took place in Gothenburg, attended by six members. A final CAP in-service webinar for Nebraska Extension educators was presented in late August and the recording made available on the CAP Nebraska Extension in-service website.

Impact

This project positively impacted producers by demonstrating how environmental incentive programs can be integrated into crop budgets using the ABC tool. It increased awareness of how financial incentives can be evaluated in management decisions and highlighted the tool's potential to explore profitability and sustainability trade-offs. By engaging producers and educators, the project enhanced understanding of how participation in incentive programs can influence both short-term profitability and long-term sustainability. Insights from this work will guide future improvements to make the ABC more user-friendly and better equipped to model and compare incentive-program participation, helping producers more effectively assess the economic outcomes of conservation practices.

Future Objectives

Future efforts will focus on implementing the six identified enhancements to the ABC tool as funding becomes available. Each improvement will be paired with targeted education to ensure effective use by producers, educators and advisors. Training and feedback opportunities will help align updates with real-world needs. The overarching goal is to make the ABC a more robust, intuitive decision-support tool that helps producers evaluate the financial and agronomic trade-offs of incentive-program participation.

LEARN MORE

SCAN NOW
or visit cap.unl.edu to view the CAP webinar recording

Center for Agricultural Profitability noon-hour webinar (Analyzing the Profitability of Stacked Extended Crop Rotations for Soil Health Using the Agricultural Budget Calculator Program).

Mitigating Tar Spot Disease in Nebraska Irrigated Corn

RESEARCH TEAM | Dr. Tamra Jackson-Ziems, Talon Mues, Dr. Saleh Taghvaeian, Dr. Derek Heeren
FUNDING AWARDED | $52,814

PROJECT DURATION
July 2023–June 2025

Research Conducted

The fungal diseases tar spot and southern rust were growing threats to corn production in Nebraska during the last two growing seasons. Canopy conditions, especially increased relative humidity and periods of leaf wetness, can worsen some diseases, such as tar spot and southern rust. The impact of pivot irrigation on canopy conditions and corn diseases is not well understood. The objectives of this research were to monitor and report tar spot distribution and compare tar spot development timing and severity under adjacent irrigated and rainfed environments.

Findings and Recommendations

Weather station data from the corn microclimate under irrigation recorded a decrease in temperature for an average of 8 hours of up to 16.5 degrees Fahrenheit. Relative humidity increased under irrigation by up to 46% for more than 10 hours. Leaf wetness persisted for more than 8 hours following an irrigation event. When comparing the two irrigated regions (second inner span versus the last outer span), irrigation events lasted 75 minutes longer in the second inner pivot span than the last span. Corn leaves under the second inner span were wet for 1.75 hours longer than those in the outer span. Tar spot averaged 3.5%, 3.3% and 1.6% disease severity in the second inner span, last span and rainfed corner, respectively. Southern rust, a disease that inflicted much yield loss in 2024 (and was very important again in 2025), displayed similar results with the second span, last span and rainfed corner averaging 5.4%, 4.8% and 1.9% disease severity, respectively. This research concluded that pivot irrigation creates more favorable disease conditions by decreasing temperature, increasing relative humidity and increasing leaf wetness duration. Disease was more severe in pivot irrigated regions of fields than in neighboring rainfed environments.

Impact

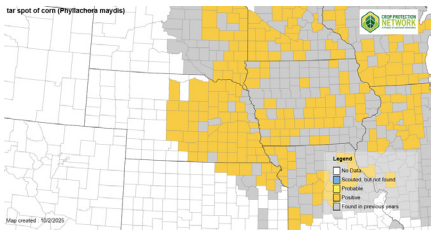
Results from this project confirm that pivot irrigation alters the corn microclimate, making it more favorable for some diseases. Emphasis should be placed on scouting pivot irrigated fields to detect disease pressure early and allow for treatment as needed.

Research from this study has improved the University of Nebraska–Lincoln's recommendations on scouting practices. It is now recommended to scout for tar spot closer to center-pivot points or other high relative humidity field regions where disease develops earliest.

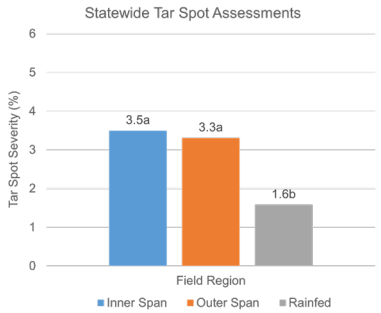
Future Objectives

Research on the impact irrigation has on canopy microclimate and disease development will continue. The efficacy of fungicide applications made by chemigation will be tested for tar spot control.

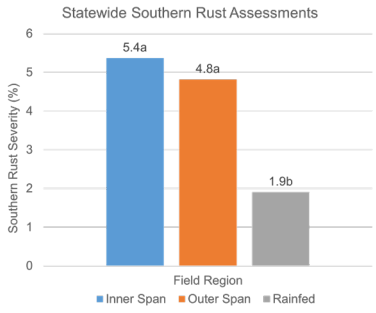
Southern corn rust plus tar spot.



Tar spot distribution in Nebraska for September 2, 2025: https://cropprotectionnetwork.org/maps/tar-spot-of-corn.



Tar spot severity across the three field regions. Columns with the same letters are not different, p-value > 0.05.



Southern rust severity across three field regions. Columns with the same letters are not different, p-value > 0.05.

WHAT'S NEW?

Pivot irrigation doubled disease severity compared to their rainfed corners in 2024.

Understanding Crown Rot Disease in Corn

RESEARCH TEAM | Dr. Tamra Jackson-Ziems, Mukuma Chikoti, Christopher Termunde (UNL)
FUNDING AWARDED | $63,094

PROJECT DURATION
July 2023–June 2025

Plants with crown rot symptoms may senesce early and die.

Research Conducted

Crown rot is an emerging threat to corn production in the Midwest, causing yield loss through premature senescence, plant death and crown tissue decay. This project focused on identifying key pathogens causing crown rot and developming a standardized inoculation method for hybrid resistance screening. The project further assessed the timing of early infection and symptom development from seedling stage V3 (three collars) to late-season R5 (dent). A total of 703 samples were collected by research partners at Bayer Crop Science and the University of Nebraska–Lincoln's team members from 21 counties across seven states. Additionally, 100 pairs of neighboring V3 symptomatic and asymptomatic plants of each hybrid at three western Nebraska locations were monitored at five crop stages for the duration of the season through R5. In greenhouse studies, a toothpick wounding inoculation method was optimized to evaluate pathogen virulence. Experiments were conducted with sweet corn and dent corn hybrids against five suspected crown rot pathogens recovered from earlier survey samples.

Findings and Recommendations

Fusarium species accounted for 58.7% of all the fungi recovered from the crowns of plants collected in the survey. Among the *Fusarium* species, members of the *Fusarium graminearum* species complex (FGSC) were the most frequently isolated pathogens, accounting for 36% and 42% in early and late-season samples, respectively. Additionally, FGSC infected corn as early as the V3 stage, with incidence peaking later during the reproductive stages, R2 (blister) and R5. These results highlight the possible key role of FGSC in crown rot disease and should be prioritized as targets in developing management strategies. Corn hybrid differences were noted at three locations in two western counties. In these locations, V3 plant symptoms were good predictors of R5 crown rot development in a hybrid at two of three locations and can serve as an early indicator of future crown rot when observed during crop scouting. Further, the toothpick inoculation method effectively induced crown rot symptoms with three of the *Fusarium* species and revealed differences in disease severity between dent and sweet corn hybrids. This greenhouse assay is recommended for early screening of hybrids in crown rot resistance breeding programs.

Impact

Given the limited knowledge on crown rot in the U.S., results from this project provide critical insights toward developing management strategies aimed at reducing yield loss. Identifying the causal pathogen(s) and when infection occurs is essential for advancing both scientific knowledge and practical management. Evidence suggesting that early infection can lead to crown rot later may indicate potential to interrupt the disease cycle early for more disease management options. Moreover, establishing a reliable greenhouse hybrid screening method facilitates more efficient evaluation of disease resistance in other corn germplasm lines. These results could make disease-resistant corn hybrids more quickly available to farmers to mitigate the impact of crown rot.

Future Objectives

The research team will continue efforts in key areas including (a) evaluating the predictive potential of early-season disease symptoms for late-season crown rot development; (b) characterizing the timing of infection of important crown rot–associated pathogen groups; (c) conducting a genetic diversity study of FGSC fungal isolates; (d) assessing fungicide resistance within this pathogen group; (d) evaluating the association between nematode population densities and crown rot development and performing microbial community analyses of plant tissue and soil samples to investigate the potential interaction of other microbes in disease development and (f) investigating potential early-season options for crown rot management.

Decaying tissue in the plant crown below ground is typical of crown rot disease.

WHAT'S NEW?

Early season stunting may predict late season crown rot.

Developing Beneficial Entomopathogenic Nematodes for Corn Rootworm Control in Nebraska

RESEARCH TEAM | Dr. Thomas Powers, Dr. Julie Peterson, Dr. Teddy Garcia-Aroca (UNL)
FUNDING AWARDED | $69,350

PROJECT DURATION
July 2024–June 2025

Research Conducted

The impact of western corn rootworm on corn production has been estimated at nearly $1 billion per year. Rootworm resistance to insecticides, including Bt (*Bacillus thuringiensis*), has compromised rootworm-management efforts. Management of corn rootworm by the application of entomopathogenic nematodes (EPNs) is a promising method of biological control. The EPN products currently available worldwide are used against a variety of insect pests. To realize EPN potential in Nebraska corn fields for corn rootworm, this project has been taken up by a collaborative team of researchers to map and monitor beneficial EPN in Nebraska, develop supporting tools and methods to do so and develop EPN as a new affordable corn rootworm control option.

Findings and Recommendations

More information is now available on basic EPN biology, distribution and identification. Three new strains of native EPN have been discovered in Nebraska that could serve as a biological control of pest insects. These nematodes are effective because they locate and infect corn rootworm larvae, inject insect-specific toxic bacteria into the larvae and kill the rootworm within 24–48 hours. In project year one, the feasibility of using nanopore sequencing to detect EPNs from Nebraska soils was established. DNA barcoding methods can distinguish the native species of EPNs from other nematodes including commercial EPN products that are currently marketed for insect control. These DNA techniques determined that the native species persist in many fields in Nebraska across multiple seasons. This suggests that there are EPN survival strategies or alternative hosts for native EPNs in Nebraska soils. Therefore, the team recommends investing in additional resources in culturing and field-testing native EPN strains.

Using newer high-throughput DNA sequencing methods, they have successfully identified EPN DNA from Nebraska soil. This approach, termed environmental DNA analysis, used MinION nanopore sequencing technology. The technology allows for in-house, simultaneous analysis of millions of DNA sequences from multiple organisms extracted directly from fields. The team is assessing the sensitivity of the technique by spiking soils with varying numbers of target infective EPN juveniles to establish the limits of detection. It is also necessary to populate public DNA databases, such as GenBank, with target EPN DNA sequences to enhance the search capabilities for target nematode species.

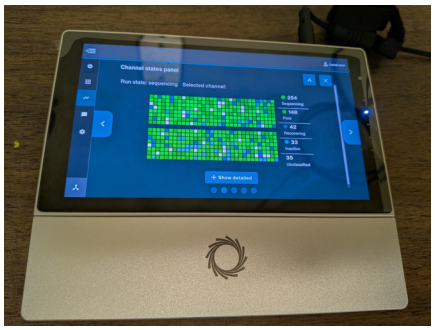
Impact

It is believed, based on survey and field trials with commercial EPN formulations, that a benefit may be accrued by using native EPN isolates. EPN persistence of commercial strains does not appear as common as persistence among native strains in Nebraska. The potential impact, if successful, would lead to the development of a Nebraska-based biological control approach for western corn rootworm that could lead to targeted and more affordable rootworm management.

Future Objectives

Refining and validating EPN identification in Nebraska corn fields is a continuing objective. Future goals include determining the limits of sensitivity of EPN detection compared to conventional soil baiting assays. Moving forward, the project will initiate rearing and testing of the native EPN isolates.

Pratibha Karki, UNL research technician, loads a MinION flow cell for NanoPore DNA sequencing.



The user interface of ONT MinION Mk1C device during a DNA sequencing run.

WHAT'S NEW?

Using newer high-throughput DNA sequencing methods, the team has successfully identified EPN DNA from a 10-gram sample of soil from Brule, Neb., known to contain a native EPN species in the genus *Steinernema*.

Daugherty Water for Food Global Conference Field Tour

RESEARCH TEAM | Arianna Elnes (DWFI), Ashley Larson (Midwest Dairy), Rachael Whitehair (Nebraska Corn Board)
FUNDING AWARDED | $2,500

PROJECT DURATION
May 2025

Dr. Galen Erickson leading attendees through a tour of the Klosterman Feedlot Innovation Center.

Program Conducted

The Daugherty Water for Food Global Institute (DWFI) at the University of Nebraska hosted its Water for Food Global Conference with the theme A Resilient Future: Water and Food for All. It brought together more than 350 people, including researchers, agencies, companies, growers and nonprofits, from 23 countries to share practical solutions and new tools. As a supplement of the event, a full-day field tour hosted by DWFI and sponsored by the Nebraska Corn Board, Nebraska Soybean and Midwest Dairy offered attendees an opportunity to see Nebraska operations before the scheduled breakout sessions and hear challenges and opportunities directly from growers.

Outcomes

More than 20 people joined the tour. The day started at RealmV, an ag-tech company headquartered in Lincoln, where participants learned how big data and automation can guide decisions at scale. The group then visited the University of Nebraska–Lincoln Animal Sciences Complex to understand how researchers are measuring methane from dairy cattle fed experimental rations and how simple, app-based tools can help producers track day-to-day sustainability goals. Next, at the Klosterman Feedlot Innovation Center, Dr. Galen Erickson showcased the state-of-the-art research facility and several of the ongoing projects on site, including feeding trials, pen style trials and data-driven husbandry. On the road between stops, Dr. Javed Iqbal discussed irrigation in real time, describing how producers utilize precision equipment to balance crop health, sustainability and economics. The day finished at Dave Nielsen's third-generation dryland farm, where long-running no-till and conservation practices support corn, soybeans and hay.

Impact

These tours help people understand what Nebraska agriculture truly looks like, along with the real challenges and opportunities farmers face, so discussions and decisions are grounded in day-to-day reality. Attendees left with clear examples they can use in their discussions and future research.

Nebraska Farmer Dave Neilsen discussed his family's operation with attendees.

WHAT'S NEW?

This is the second iteration of field tours hosted by DWFI and sponsored by commodity groups. This year welcomed Midwest Dairy as a new sponsor.

Innovative Youth Corn Challenge

RESEARCH TEAM | Brandy VanDeWalle, Aaron Nygren (UNL)
FUNDING AWARDED | $9,000

PROJECT DURATION
Ongoing since July 2013

Program Conducted

The Nebraska Innovative Youth Corn Challenge (IYCC) equips youth with the knowledge, skills and experience needed to pursue careers in agriculture and pest management. The program aligns with the United States Department of Agriculture's (USDA) 2024 Farm Labor Report, which highlights the ongoing demand for agricultural workers, especially in crop production. Through hands-on experience in pest management, IYCC fosters the next generation of agricultural professionals ready to address pest resistance, environmental challenges and food security.

Participants learn to evaluate the benefits of new products and practices through on-farm research as part of their 4-H or FFA projects. With guidance from an Extension Educator, agriculture teacher, or other qualified mentor, youth design and conduct research trials to improve crop yields. They complete a report documenting data such as production costs and yields, which may be published through the Nebraska On-Farm Research Network. Additionally, participants create a multimedia project—such as a video or graphic—to share their research and promote modern corn production practices.

Outcomes

Since its inception in 2012, the IYCC has engaged 105 teams, with 57 teams successfully harvesting and analyzing plot data. A total of 307 youth have participated, with six teams currently competing. During the most recent growing season, six participants reported a combined total of 288 hours on their plots. Based on participation estimates, youth have collectively invested more than 2,000 hours in the program.

Evaluation results show that 100% of current participants (N=12) improved their ability to identify pests, conduct crop scouting, set up research plots, determine practice profitability and evaluate new products and practices. One participant noted, "I enjoyed having a project last for a long duration and seeing the end results."

Impact

Over 13 years, the partnership between the Nebraska Corn Board (NCB) and the IYCC has successfully engaged youth in agricultural, science-based learning. Long-term program evaluation of nearly 300 participants shows that more than 100 alumni have pursued careers in agriculture or STEM fields. The program continues to evolve to maintain its relevance, offering new opportunities while preserving its core focus on research-based learning. This sustained innovation has attracted interest from 4-H club leaders, FFA advisors, and extension faculty nationwide.

Future Objectives

Building on this long-standing success, the program's goals remain focused on developing youth skills and interest in agricultural research. In 2025, a new program option will be expanded to increase accessibility for all youth—regardless of agricultural background or land access—while fostering stronger industry engagement and collaboration with area farmers. Efforts will also aim to boost participation and explore synergies with UNL-TAPS, ensuring the program continues to grow and serve Nebraska's agricultural future.

> "There have been numerous individuals (participants) who have gone into ag fields. Two went to farming, one ag retail and one agronomy."
>
> – FORMER INNOVATIVE YOUTH CORN CHALLENGE ADVISOR

Challenge participants count kernels to conduct yield estimates for their four different plot areas.

Arlington FFA corn challenge team meets in their 2025 plot to conduct their weekly scout. A Nutrien employee helps guide the team in conducting growth staging and scouting exercises.

Challenge participants taking a close look to ensure root health and proper growth while counting leaf collars to stage the corn.

PLAY VIDEO

Arlington FFA created a short video capturing their field project efforts in 2023.

Ag Literacy Festivals

RESEARCH TEAM | Cole Meador, Brett Kreifels (UNL)
FUNDING AWARDED | $7,500

PROJECT DURATION
Ongoing since July 2023

Program Conducted

Agriculture Literacy Festivals are held across the state, educating youth about Nebraska's number-one industry: agriculture. The program seeks to increase student knowledge, understanding, positive attitudes and interest in the food system. As a result, youth gain a better understanding of agriculture's impact on Nebraska and become more informed consumers who can make well-informed decisions concerning agriculture issues.

Outcomes

In 2024–2025, 19 Ag Literacy Festivals educated 6,325 second-, third-, fourth- and fifth-grade students from 150 schools in 68 communities across Nebraska. Major funding from the Nebraska Corn Board helps obtain and leverage funds from other partners, including the Midwest Dairy Association, which supports dairy producers in presenting and bringing cattle to festivals as well as providing food samples. Additional supporters include the Alliance for the Future of Agriculture in Nebraska, Ag in the Classroom, local and state commodity boards, local farm bureaus and fair boards, farmers, FFA chapters, implement dealers and Nebraska Extension faculty and staff.

Students learn about drone technology and how it can be used in farming

> "This event is a great opportunity for learning to take place outside the classroom. It helps enrich our classroom curriculum. It shows students that agriculture is not just being a farmer. With our community not being rural like in the past, I feel it is even more important for our students to have this educational experience."
>
> – TEACHER FEEDBACK

Students interact with dairy cattle and other livestock at the festival

Students take a group photo in front of a combine.

Impact

Based on teacher evaluations (N=91), 91% said that they "agreed" or "strongly agreed" that their students learned more about agriculture and the food system by attending. All teachers surveyed said they would attend another Ag Literacy Festival in the future. Since the creation of Ag Literacy Festivals, 96,989 elementary students have attended.

Comments and feedback from students and teachers:

- The machines and the drones help look at crops and can make important decisions about where to plant or what crop needs help."
  —Student comment
- We need farmers for everything, because they make our food."
  —Student comment
- I thought the experience was very informative and taught a lot of engaging material. Students seemed to enjoy learning about an integral part of our community and seeing how much of our lives are impacted by agriculture."
  —Teacher feedback

Future Objectives

Agriculture Literacy Festivals will continue for the 2025–2026 fiscal year. Festivals began in September 2025 and will continue through the spring of 2026.

Nebraska Agriculture & Science Education Leadership Institute (NASELI)

RESEARCH TEAM | Jennifer Jones (Ogallala Public Schools), Jodi Bahr (Harvard Public Schools), Shawna Roberson (Vivayic, Inc.)
FUNDING AWARDED | $33,000

PROJECT DURATION
July 2024–June 2025

Program Conducted

The Nebraska Agriculture and Science Education Leadership Institute launched its inaugural year to strengthen Nebraska science education by embedding the science of food and fiber production into standards-aligned instruction. A founding cohort of teacher leaders participated in multi-day workshops, on-farm learning with producers and collaborative virtual sessions to localize lessons for their students. Sponsored by Nebraska Corn Board and Midwest Dairy, additional core partners included University of Nebraska–Lincoln Extension and research sites (the Panhandle Research, Extension and Education Center and the North Platte facilities), industry partners (Western Sugar, Sustainable Beef and Kelley Beans), the North Platte Natural Resources District and local producers across grain, beef and dairy sectors. Teacher leaders adapted existing agricultural-literacy resources to Nebraska contexts and developed practical implementation guides for classroom use; they are sharing results through Educational Service Units, district professional development and conference presentations at the Nebraska Association of Teachers of Science and the National Science Teaching Association.

Outcomes

Year one engaged seven teacher leaders (grades 6–12) who created 20 lesson cover sheets aligned to the Nebraska Science Standards and piloted them with students, anchored by two three-day institutes in Scottsbluff and North Platte that connected the work to real agricultural systems. More than 200 students were reached directly, with more than 1,000 projected across three years as materials scale through teacher networks and Educational Service Units. Post-event surveys rated the facilitated experiences 4.6 out of 5 overall (with five being the highest) and the producer field trips 4.9 out of 5, underscoring the value of authentic, field-based learning tied to Nebraska agriculture. Dissemination to date includes one state-level presentation, with two additional conference presentations planned and facilitator training underway to support local replication. Recommended next steps are to continue pairing classroom-ready resources with field experiences, expand Educational Service Unit–hosted professional development so more districts can adopt standards-aligned agricultural-science lessons and leverage year-one teacher leaders as mentors and curriculum developers to accelerate statewide uptake.

Impact

The Nebraska Agriculture and Science Education Leadership Institute connects students and educators to the real science behind crops, livestock, water and biofuels—building trust, interest and workforce readiness. By helping teachers integrate Nebraska-specific agricultural phenomena into three-dimensional science teaching, the program ensures students see corn not just as a crop, but as a system that drives innovation, supports rural communities and underpins local and global markets. This first-year foundation of teacher leadership, industry partnerships and community connections positions Nebraska to grow a scientifically literate, agriculture-aware generation that understands how food, energy and environmental stewardship fit together.

Future Objectives

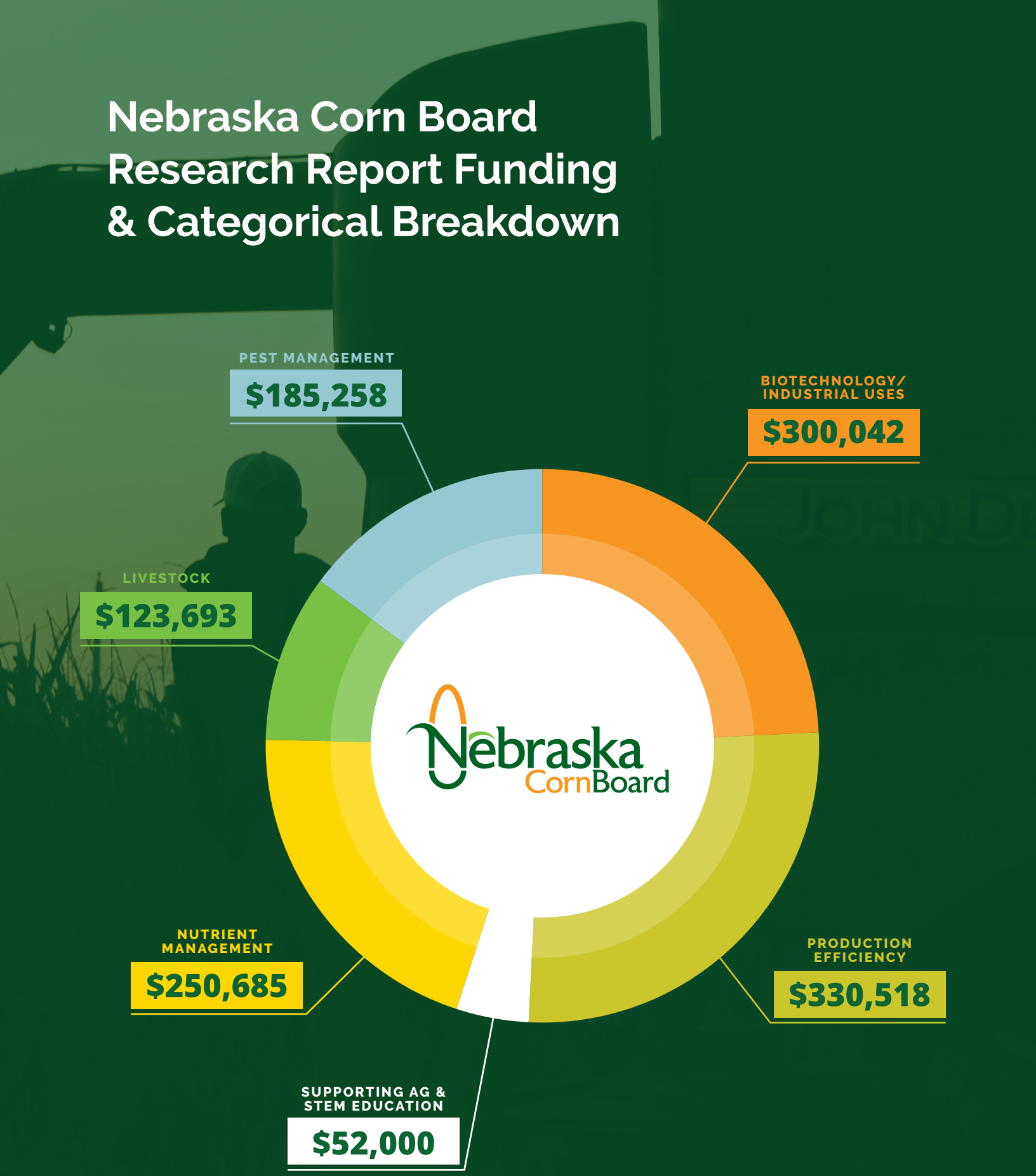
Year two will scale statewide with emphasis on central Nebraska, deepen classroom implementation and extend to elementary grades toward a comprehensive kindergarten-through-twelfth-grade model. Objectives include increasing educator participation through Educational Service Units and district professional development, integrating agriculture-based science lessons into district curricula, expanding to new regions to showcase diverse systems and empowering year-one teacher leaders as curriculum developers and mentors. A coordinated effort among Nebraska beef, dairy and corn partners will broaden content and highlight the positive impacts of agriculture across the state.

Figure from the NASELI Year 1 Impact Report

NASELI Logo

	PROJECT TITLE	FUNDING
BIOTECHNOLOGY/ INDUSTRIAL USES	Project Andromeda	$100,000
	Improving Sugar and Oil Yields from Corn via Heat-Activated Enzymes	$100,042
	Corn-to-VAM: Advancing a Corn-Based Vinyl Acetate Monomer Pathway	$75,000
	Radicle Corn Value Chain Challenge	$25,000
LIVESTOCK	Creation, Validation and Implementation of a Universal "Green/ Sustainable" Index for Beef	$50,000
	Impact of Frequency of Variation in Distillers in Feedlot Diets on Performance	$73,693
NUTRIENT MANAGEMENT	Wood Carbon Subsoil Amendment for Sustainable Corn Production on Sandy Irrigated Soils	$41,472
	Piloting the Nebraska Nitrogen Initiative	$113,238
	Improving UNL Nitrogen Algorithm with the 4Rs Nitrogen Management	$95,975
PRODUCTION EFFICIENCY	Corn Root Research for Smarter Hybrid and Nitrogen Management	$84,000
	Genome to Fields (G2F): High Throughput and Conventional Phenotyping of Grower-Relevant Germplasm in Western and Eastern Nebraska	$59,214
	Nebraska On-Farm Research Network	$72,807
	UNL Testing Ag Performance Solutions (TAPS)	$99,657
	Exploring Incentive-Program Participation with the Ag Budget Calculator (ABC)	$14,840
PEST MANAGEMENT	Mitigating Tar Spot Disease in Nebraska Irrigated Corn	$52,814
	Understanding Crown Rot Disease in Corn	$63,094
	Developing Beneficial Entomopathogenic Nematodes for Corn Rootworm Control in Nebraska	$69,350
SUPPORTING AG & STEM EDUCATION	Daugherty Water for Food Global Conference Field Tour	$2,500
	Innovative Youth Corn Challenge	$9,000
	Ag Literacy Festivals	$7,500
	Nebraska Agriculture & Science Education Leadership Institute (NASELI)	$33,000

Nebraska Corn Board Research Report Funding & Categorical Breakdown



To learn more about the Nebraska Corn Board's research programs and initiatives, visit **nebraskacorn.gov.**

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