

SOYBEAN NEBRASKA

SPRING 2021

A Publication of the Nebraska Soybean Association and the Nebraska Soybean Board



INVESTING IN INSIGHT

From soybean gall midge to asphalt recycling, research continues to be a top priority.

Learn more on pages 12-23.

8-9 Take a look at 2019-22 goals and financials from 2020.





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The Nebraska Soybean Association (NSA) and the Nebraska Soybean Board (NSB) are proud to share the FY21 Spring edition of this publication with you—members of our shared community.

Here's How It's Been Growing

- 4 | LOOKING FORWARD**
NSB Chairman Eugene Goering discusses the board's evaluation of research projects.
- 5 | OPPORTUNITIES ABOUND**
NSA President Shane Greving provides an update on meeting with government officials.
- 6 | SOYBEAN FARMERS: YOU'RE THE VOICE OF YOUR DISTRICT**
Represent your fellow farmers as a candidate for District 1, 3 or 6 elections.
- 7 | GET TO KNOW YOUR NEWEST BOARD MEMBER**
Learn about District 5 representative Brent Steinhoff, a fifth-generation farmer in Syracuse.
- 8-9 | NSB STRATEGIC PLAN AND ANNUAL FINANCIAL REPORT**
Take a look at our 2019–22 goals and financials from 2020.
- 11 | CARBON REDUCTION OPPORTUNITIES FOR NEBRASKA'S FARMERS ON THE 'RISE'**
Sustainable fuels continue to benefit carbon reduction goals.

12-23 INVESTING IN INSIGHTS

The NSB funds research that helps farmers stay abreast of the latest management and studies.

- 13 | COLLABORATION THAT COUNTS**
Researchers at the University of Nebraska-Lincoln (UNL) lead the way in food discoveries.
- 14 | FUNGICIDE RESISTANCE IN FLS AND USE OF FOLIAR FUNGICIDES IN NEBRASKA**
Get the latest report about managing frogeye leaf spot (FLS).
- 15 | SOYBEAN GALL MIDGE UPDATE**
The pest continues to spread in Nebraska and surrounding states.
- 16 | ACCELERATING SUCCESS ON YOUR FARM**
Sign up to bring the Nebraska On-Farm Research Network to your fields.
- 17 | A GROWING PROBLEM**
With greater soil testing, researchers can increase understanding of soybean cyst nematode (SCN).

- 18-19 | BRINGING THE RESEARCH TO FARMERS**
Read the latest checkoff-funded research through the Soybean Research & Information Network (SRIN).

- 20-21 | 7 QUESTIONS WITH DR. GEORGE GRAEF**
Read up on the University of Nebraska Presidential Chair in Soybean Breeding's current research programs.

- 22 | MAKING THE BLACKTOP...GREEN**
Asphalt recycling agents modified with soybean oil may soon create a new market for soybeans.

- 23 | A CHANGE IN MANAGEMENT**
Treating cover crops "more like a cash crop" can help farmers improve their fields.

- 24-25 | DATA FUNDAMENTALS**
Increased data utilization is working to support on-farm decisions.

- 27 | ABC IS READY TO USE FOR 2021 CROP BUDGETS**
Easily estimate production costs with UNL's new online Agricultural Budget Calculator.



3815 Touzalin Avenue, Suite 101
Lincoln, Nebraska 68507
402-441-3240
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The Nebraska Soybean Board is a private, nonprofit checkoff board responsible for the research and promotion of soybeans in an effort to increase the profitability of the state's 22,000 soybean producers.

Nebraska Soybean Board Members

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Anne Meis (Treasurer), Elgin

District 2

Jason Penke, Craig

District 3

Richard Bartek, Ithaca

District 4

Eugene Goering (Chairman), Columbus

District 5

Brent Steinhoff, Syracuse

District 6

Nathan Dorn, Firth

District 7

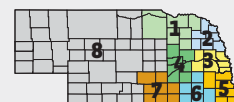
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District 8

Clay Govier (Secretary), Broken Bow

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Greg Anderson, Newman Grove



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Tony Johanson, Oakland

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Scott Ritzman

Lois Ronhovde

Teri Zimmerman

On The Cover

Photos of on-farm research across Nebraska.

Photo Credit: Laura Thompson, Thomas Hoxmeier

Note from the **EXECUTIVE DIRECTOR**



By Scott Ritzman

This SoybeanNebraska issue is centered around the checkoff investments into research and soy byproduct innovations. The board continues to emphasize production research and values the partnership developed over the years with the highly regarded researchers at UNL's Institute of Agriculture and Natural Resources. A few projects that remain a priority are the breeding and genetics program, soybean gall midge and improving soybean germplasm for aquaculture feed.

Because Nebraska soybean producers grow a high-quality soybean with an exceptional composition makeup of protein and oil, it opens doors for new opportunities. Due to additional soybean oil available, we saw tremendous growth in consumer and industrial soy-based products. Notably, over the past few years, soybean oil use has grown in asphalt and concrete sealer with companies developing products using soybean oil as a key component. The Nebraska Soybean Board, along with the United Soybean Board, continues to push the needle on research topics and seek out new ways to utilize the abundance of soybean oil that is domestically available from a strong livestock industry consuming soybean meal.

I wish everyone a safe planting season.

View from the Chair

LOOKING FORWARD

*By Eugene Goering
Nebraska Soybean Board Chairman, Columbus*



It's a snowy day in February. What is a soybean farmer doing? Marketing last year's crop and planning for a new crop? Hauling soybeans to market? Planning for the growing season ahead? Working on honey-do projects? Working in a farm shop or with livestock? It all needs to be done.

The members of the Nebraska Soybean Board also add preparation for the March meeting to farmer's lists. At the meeting, we focus on evaluating and approving research projects. This fiscal year, \$2,415,000 will be invested in production research. Next fiscal year's requests for proposals, regarding research, have been sent out and returned. Now each board member reads, studies and scores each project. Some are continuing multi-year projects and some are new.

Most projects are focused on genetics, breeding lines, pests, herbicides and fertility. There are also many projects that are basic research about the science and biological factors of soybean plants involving growth, oil and protein. Some projects cover new uses such as soy oil in concrete and asphalt preservatives. Another project focus is on enzymes from soybeans for human health.

Along with the board member evaluations, we have several industry experts evaluate each proposal. The staff compiles all the evaluations for us to study again, and in the March meeting, we go over each project, discuss and then vote where to invest the checkoff funds.

The February snow days give me time to work, study and prepare for the March meeting. I have read many great projects, and we have a lot of decisions to make. I don't usually look forward to snow days, but I stay busy while snow blows outside. I hope you all had a productive winter as we anticipate spring.

From the Association

OPPORTUNITIES AROUND



By Shane Greiving, NSA President

The springtime brings many opportunities to our farm as we get ready for a busy planting season. Opportunities lie ahead for the soybean association as we look to new faces within the Administration and new policy resolutions for the coming year.

In late February, Secretary Tom Vilsack was confirmed to return as the head of the United States Department of Agriculture. He was previously in the same role under President Obama's administration. He will bring a wealth of experience. He is known for his support of renewable fuel initiatives, biotechnology advances, fair trade and preserving the farm safety net. Secretary Vilsack gained his agricultural knowledge during his term as Governor of Iowa, a large soy producing state. Vilsack has expressed his belief that climate can provide market opportunities for farmers. Soybean leaders in the Nebraska and American Soybean Association look forward to working and giving input on these key priorities. Also, working with a new U.S. Trade Representative will be another important priority for soy growers.

The American Soybean Association held their virtual delegate policy resolutions session in February to set direction for policy and advocacy for the year ahead. Seven voting delegates from NSA participated in this process, which builds on existing resolutions as well as addresses the new and emerging priorities for soybean growers.

During the resolutions session, delegates recognized the role that climate and conservation, from a soy grower's perspective, plays. Many service markets are beginning to develop as a tool to improve environmental stewardship. One such resolution that was adopted by the voting delegates was to support the development of voluntary carbon markets, which incentivize agricultural conservation. Other approved key issues included maintaining a strong safety net and crop insurance program, identifying additional funding mechanisms for rural broadband investment and deployment, as well as the Trade Promotion Authority (TPA) reauthorization and making sure a sufficiently funded Commodity Credit Corporation account is maintained. Our policy work on behalf of soybean farmers never quits.

I hope you have a safe planting season and enjoy getting back in the dirt, I know I will!

Soybean Association Recognizes Leaders at Annual Meeting



Victor Bohuslavsky
Soy Promoter Award



Lucas Miller



Shane Greiving

During the NSA's annual winter meeting, Victor Bohuslavsky was presented the NSA's 2020 Soy Promoter Award. Victor previously served as the executive director of the Nebraska Soybean Board for over 21 years. In addition, Lucas Miller of Randolph was elected as an association director representing District 2 soybean producers on policy issues. Shane Greiving of Chapman was re-elected to a second term as NSA president.



4435 O Street, Suite 210

Lincoln, NE 68510

Phone: 402-441-3239

association@nebraskasoybeans.org
nesoybeans.org

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Shane Greiving, Chapman, At Large

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Lucas Miller, Randolph – **District 2**

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Wade Walters, Shickley – **District 7**

Craig Frenzen, Fullerton – **At Large**

Shane Greiving, Chapman – **At Large**

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A member-driven, grassroots policy organization that represents U.S. soybean farmers

American Soybean Association Directors

Dennis Fujan, Prague

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Phone: 402-441-3239

Email: tom@nebraskasoybeans.org

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SOYBEAN FARMERS: LET YOUR VOICE BE HEARD

CAST YOUR VOTE IN THE 2021 BOARD MEMBER ELECTIONS.

Election Schedule



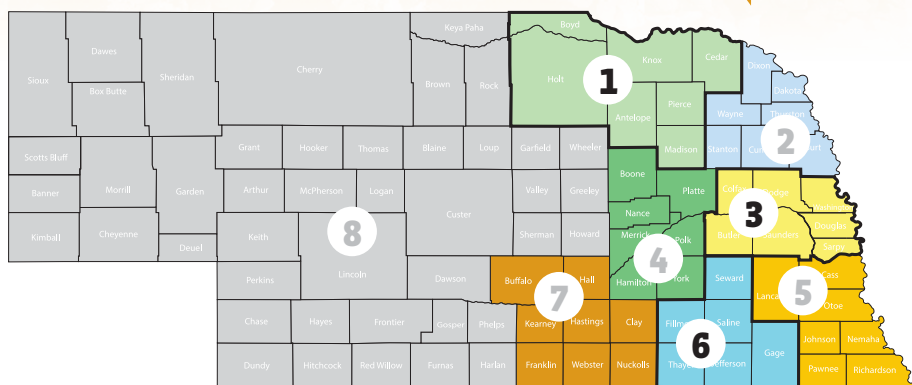
Districts 1, 3 & 6



Districts 2, 4 & 8



**Districts 5, 7
& At-Large**



Nebraska Soybean Board District Map

The election is conducted by mail-in ballot in July for Districts 1, 3 and 6. Soybean farmers who reside in counties that are up for election in 2021 will receive ballots and candidate information regarding NSB's election process via direct mail.

Election districts and counties are:

- ✓ District 1: Counties of Antelope, Boyd, Cedar, Holt, Knox, Madison and Pierce
- ✓ District 3: Counties of Butler, Colfax, Dodge, Douglas, Sarpy, Saunders and Washington
- ✓ District 6: Counties of Fillmore, Gage, Jefferson, Saline, Seward and Thayer

To apply for a candidacy in District 1, 3 or 6 you must:

- ✓ Obtain a NSB Candidacy Petition by contacting NSB's executive director at (402) 432-5720
- ✓ Complete the petition and collect the signatures of at least 50 soybean farmers in their district
- ✓ Return petition to NSB office on or before April 15, 2021

Nebraska Residents Cast the Deciding Vote

Our shared soybean farmer community determines electoral winners. These voters must be:

- ✓ **Nebraska residents**
- ✓ **District 1, 3 or 6 residents**
- ✓ **Soybean farmer who owns or shares the ownership and risk of loss for such soybeans, by reason of being a partner in a partnership, or is a shareholder in a corporation, or is a member of a limited liability company, during the current or immediately preceding calendar year.**



Election Calendar:

APRIL 15, 2021

Candidacy petitions due to NSB office

JULY 2021

Ballots mailed to eligible voters

JULY 31, 2021

Final day to return ballots for consideration

OCTOBER 1, 2021

Newly elected board members' terms begin

**Reach out to the NSB team
for more information at
402-441-3240.**

Get to Know Your Newest

BOARD MEMBER

**BRENT
STEINHOFF**



District 5 Board Member | Syracuse, Nebraska



What does your farming operation look like?

I am a fifth-generation farmer in Otoe County. My wife, Erin, and I farm near Syracuse with the assistance of my father, Arlin, and our three children, Diego-12, Aiden-10 and Rylee-4. We have a small diversified farm, raising corn, soybeans, alfalfa, a small cow-calf herd and a small flock of chickens.

How has your operation adapted over the years and how is it approaching the upcoming years?

Our operation has changed continually over the years. We used to practice conventional tillage and walked beans. We then transitioned to using some chemicals and no-till practices. Currently, we still do some no-till but have incorporated some conventional tillage back in due to weed pressure.

What is an important benefit that the Nebraska Soybean Board has for farmers across the state?

Since serving on the Nebraska Soybean Board, I can see the important benefits that the checkoff has across the

state. These benefits include research plots, adopting different varieties in different areas of the state and our representation among the other commodity groups.

As a board member, what is a goal or area of the checkoff that you are excited about getting involved in?

As a Nebraska Soybean Board member, I have a goal to promote the soybean industry the best way possible. I look forward to my involvement with the research and education committees and helping to expand our networking with other countries to increase their use of soybeans.

In one sentence, why do you farm/enjoy farming?

Being able to plant something and see it grow is the main reason I enjoy farming so much.

What is one thing that amazes you about the power of soy/growing soybeans?

I have always been amazed at how soybeans can adapt to weather or climate, producing such a useful product worldwide.

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NEBRASKA SOYBEAN BOARD

Strategic Plan

FOR FISCAL YEAR 2019-22



VISION:

The farmer's investment in the Nebraska soybean checkoff results in sustainable soybean production and increased demand.



CORE VALUES:

Integrity
Honesty
Commitment



MISSION:

Invest checkoff funds toward innovative research and soybean production, enhancing consumer and industry education and creating demand for soybean products.

STRATEGIC OBJECTIVES

1.

Maximize production and utilization of Nebraska soybeans through research.

2.

Invest in the education and acceptance of soybean products.

3.

Continue to establish relationships and partnerships with end users to grow domestic and international soybean demand.



Checkoff Working For You

Recent United Soybean Board ROI Study

Once every five years, the soy checkoff is required by the U.S. Department of Agriculture to undergo analysis of the economic effectiveness of the program and to demonstrate its benefit to U.S. soybean farmers and other checkoff stakeholders.

The independent economic study, which analyzed the demand—and supply—enhancing activities funded by the soy checkoff between 2014 and 2018, was conducted by Dr. Harry Kaiser of Cornell University. Dr. Kaiser is a leading research expert in the field of agricultural economics and its application to commodity checkoff programs.



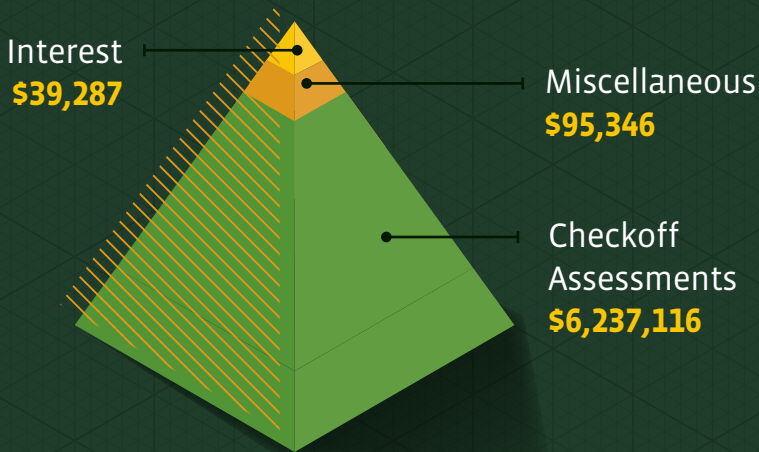
For every dollar farmers invested in the soy checkoff over this 5-year period (2014-2018), all U.S. soybean farmers received an estimated **\$12.34** in added value.

NEBRASKA SOYBEAN BOARD ANNUAL FINANCIAL REPORT

FISCAL YEAR 2020

FUNDING REVENUE

TOTAL \$6,371,749



NET ASSETS

Year Beginning October 1, 2019

\$6,114,004

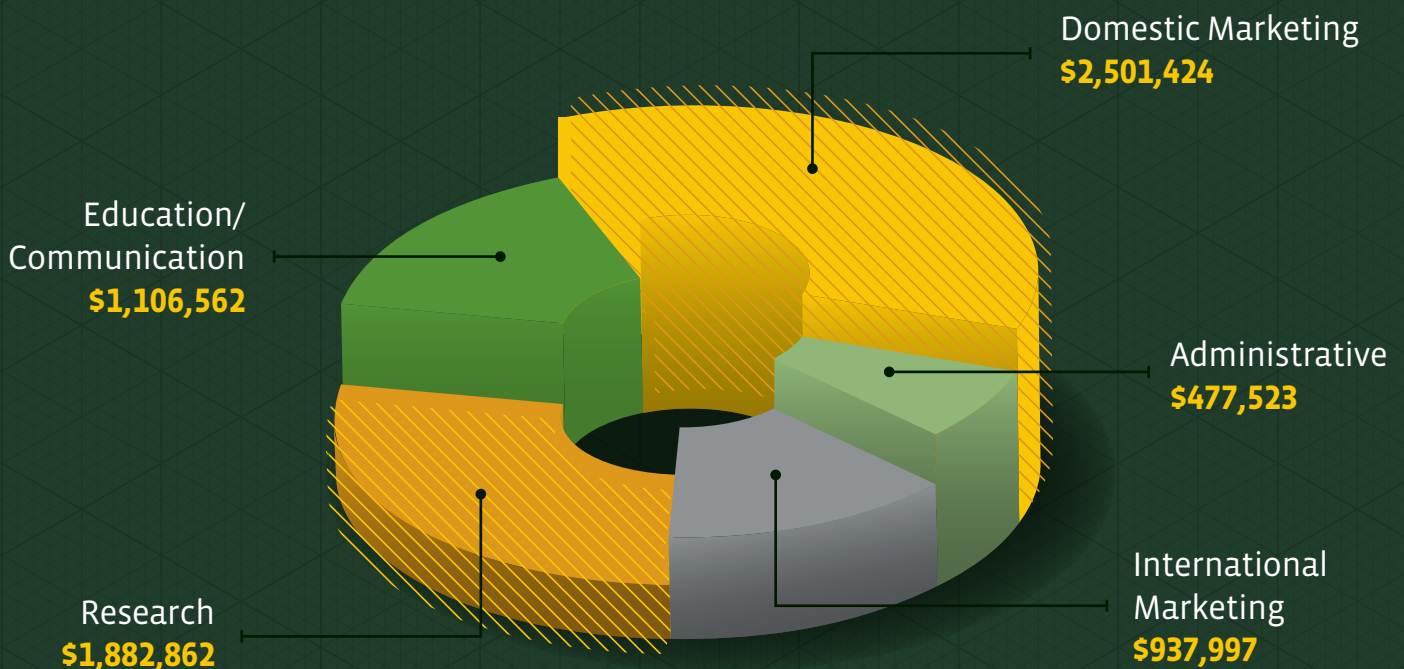
NET ASSETS

Year Ending September 30, 2020

\$5,579,385

FUNDING DISBURSEMENTS

TOTAL \$6,906,368






unitedsoybean.org

RESEARCHING A BETTER BEAN

Whether you're dealing with drought, flood, heat or other climate-related stress, the soy checkoff is working behind the scenes to diversify U.S. soybean genetics and increase stress tolerance. We're looking inside the bean, beyond the bushel and around the world to keep preference for U.S. soy strong. And it's helping make a valuable impact for soybean farmers like you.

See more ways the soy checkoff is maximizing profit opportunities for soybean farmers at unitedsoybean.org

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Carbon Reduction Opportunities for Nebraska's Farmers on the

"RISE"

By Samantha Turner, NBB Communications Manager

The National Biodiesel Board kicked off the new year with its annual premier event, showcasing an industry on the "Rise." During the 2021 National Biodiesel Conference & Expo, the biodiesel and renewable diesel industry looked at the upcoming opportunities for carbon reduction in the marketplace.

In his annual State of the Industry Address, National Biodiesel Board CEO Donnell Rehagen pointed to factors contributing to increased demand for biodiesel and renewable diesel.

"Last year we unveiled Vision 2020, our plan to grow to over six billion gallons by the year 2030, and, with advancements in feedstocks, 15 billion gallons by 2050," he said. "The biodiesel and renewable diesel industry believes we will have the

production and market demand to reach this previously unimaginable goal by 2030."

Rehagen said states across the country have embraced sustainable fuels as part of their own efforts to mitigate greenhouse gas emissions within their borders. With states embracing commitments to sustainable fuels and more corporations adding their own carbon reduction goals, this industry is poised to keep rising.

"At the beginning of 2020, markets began to reflect our industry goals. We saw biodiesel production reach more than 130 million gallons in the first month and a wave of corporations announced their commitments to carbon reduction, including Amazon, Walmart, Ikea, Pepsi, McDonalds, and many others."

The industry depends on today's and tomorrow's farmers and oilseed processors. A six billion gallon industry in 2030 will demand more than 18 billion pounds of soybean oil each year. U.S. farmers will continue to lead the way in producing the feedstocks necessary to provide a better, cleaner future. Given the push to reduce carbon, NBB predicts growing momentum for the Vision throughout 2021 and the years to come.

The building blocks to grow our industry are in place. With Nebraska soybean farmers, the industry can make strides in achieving set goals with domestically produced feedstocks. The help from Nebraska, and other producers, will lead the industry to "Rise" in 2021 and beyond.

RESEARCH

INVESTING IN INSIGHT

The Nebraska Soybean Board continues to fund critical research that helps growers understand best practices for managing their fields, pests and weeds.

13 | Collaboration That Counts

The University of Nebraska-Lincoln (UNL) is discovering how to feed a growing world.

14 | Fungicide Resistance in FLS and Use of Foliar Fungicides in Nebraska

UNL researchers discuss how to manage frogeye leaf spot (FLS).

15 | Soybean Gall Midge Update

Soybeans' threatening pest has spread in Nebraska, Iowa, Minnesota and South Dakota.

16 | Accelerating Success on Your Farm

Learn about 2020 Nebraska On-Farm Research Results and how to get involved.

17 | A Growing Problem

The Soybean Cyst Nematode (SCN) Sampling Program encourages greater testing.

18-19 | Bringing the Research to Farmers

The Soybean Research & Information Network (SRIN) is your go-to for checkoff-funded research.

20-21 | 7 Questions with Dr. George Graef

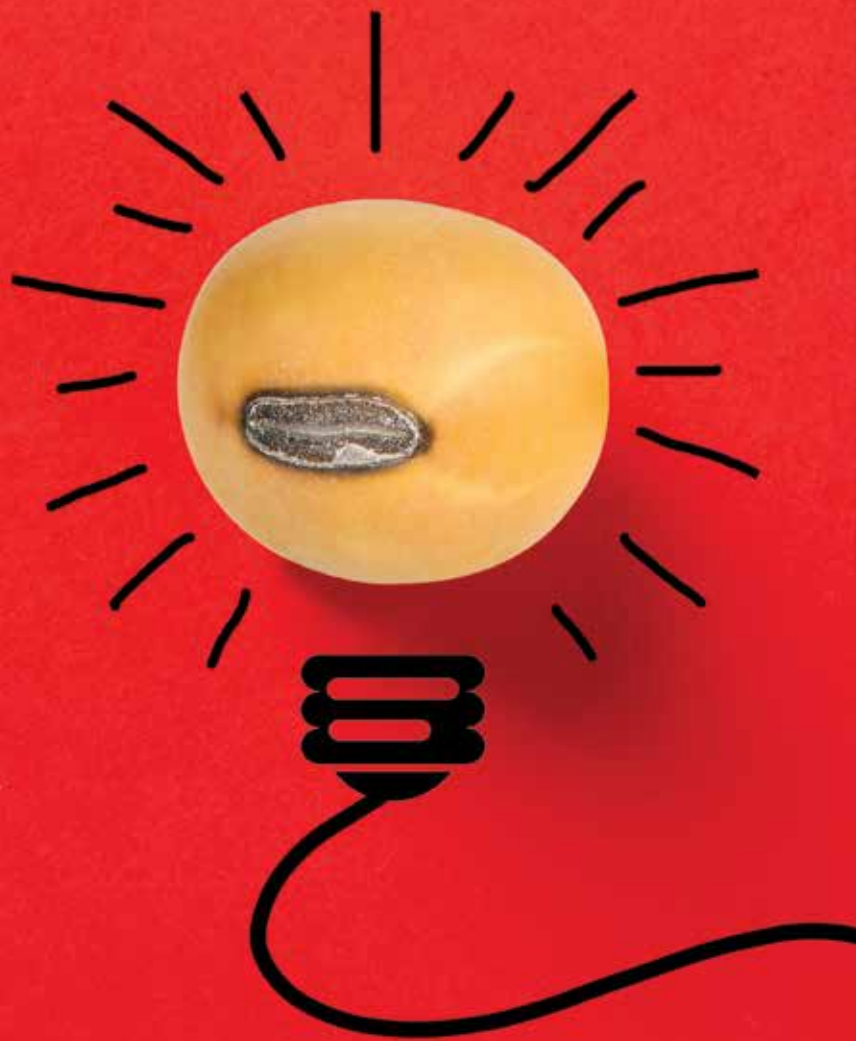
The renowned soybean breeder shares updates on his current research.

22 | Making the Blacktop...Green

Asphalt recycling agents modified with soybean oil may soon create a new market for soybeans.

23 | A Change in Management

Nebraska on-farm research has proven the benefit of cover crops and the need to strategically integrate them into farmers' field management plans.



RESEARCH COMMITTEE



Nathan Dorn (chair)

Eugene Goering

Clay Govier

Doug Saathoff

COLLABORATION THAT COUNTS

NSB funding helps the University of Nebraska–Lincoln’s Agricultural Research Division explore ways to feed the world’s growing population.



Dr. Héctor L.
Santiago-Anadón

As agricultural researchers look toward a future with billions of mouths to feed, they see no shortage of work to be done.

At the University of Nebraska–Lincoln (UNL)—ranked among the top 20 U.S. research universities for agricultural sciences by *U.S. News and World Report*—the Agricultural Research Division’s (ARD) faculty and staff are investigating the food challenges facing the world.

“ARD faculty have a unique drive for, not only understanding fundamental mechanisms through discovery and fundamental research, but also in how those discoveries can be translated into new breeding strategies, new resistant and resilient crops, and smart technologies to maximize efficiencies

in water and fertilizer use, as well as the production of nutritious foods, new biofuels and bioproducts,” said Dr. Héctor L. Santiago-Anadón, ARD assistant dean and assistant director of the Nebraska Agricultural Experiment Station.

In his role with UNL, Dr. Santiago-Anadón helps equip ARD researchers with the resources necessary to carry out important research projects across the state. He also manages the research portfolio funded by commodity boards, including the Nebraska Soybean Board (NSB). Both the ARD and NSB know their relationship is critical to the future of agriculture.

“We understand that stakeholders’ engagement is key to our success,” Dr. Santiago-Anadón said. “To this end, it is important to continue to strengthen our partnership and foster new research collaborations with commodity boards to address current and emerging problems facing agriculture, the environment

and our natural resources—regionally, nationally and beyond.”

UNL’s ARD faculty is working on a wide variety of research, including animal agriculture, breeding programs, climate change, food security and water sustainability. Having an innovative group of researchers and the support of one of the nation’s and world’s leading agricultural research programs gives Nebraska’s soybean farmers a powerful return on their investment through the NSB.

“The ARD is led through the hard work of approximately 330 faculty members in 15 academic units at the Institute of Agriculture and Natural Resources,” said Dr. Santiago-Anadón. “As we add another 2 billion people to the world’s population, the ARD is focused on delivering research-based solutions to ensure a sustainable supply of healthy food in a sustainable way—and by doing that, we help ensure a healthy and prosperous Nebraska.”



ARD-NSB Research Impact: Soybean Gall Midge

Dr. Justin McMechan, an assistant professor in UNL’s Department of Entomology, co-led the discovery of soybean gall midge in 2018, a new and devastating insect causing injury to soybeans in eastern Nebraska and neighboring states. Dr. McMechan’s aggressive approach to studying this new pest has been fueled by the strong support he has received from the NSB and the North Central Soybean Research Program (NCSRP).

“We were very fortunate that the NSB recognized the importance of soybean gall midge shortly after it emerged as a pest,” McMechan said.

NSB support—along with the willingness of soybean growers to risk their farms—has led to a wide range of discoveries that have started to unravel the mystery around this new species. NSB-funded projects include research to determine the role of plant pathogens in soybean gall midge infestation and injury, as well as studying the impact of planting date and seed treatments for mitigating injury and losses.

Beyond Nebraska, McMechan leads a regional team of 17 researchers through NCSRP. The multi-state team is tracking the distribution of the pest, monitoring adult emergence, as well as tackling a

portion of the U.S. germplasm to identify any sources of host plant resistance.

“Soybean farmers in heavily impacted areas don’t have the luxury of time with this new pest, so we’ve tried to put as many tools and resources into their hands as we can,” says McMechan.

An alert network established in 2019 allows growers to receive an automated text message, email and phone call when adults emerge each growing season. The alert system provides growers with the critical information needed to make management decisions and monitor the new pest, which is already an uphill battle to manage.

FUNGICIDE RESISTANCE IN FLS AND USE OF FOLIAR FUNGICIDES IN NEBRASKA

By Asha G. Mane, Tamra Jackson-Ziems, Sydney E. Everhart

A foliar disease of soybean called frogeye leaf spot (FLS), is becoming more common in Nebraska (Figure 1). FLS is caused by the fungal pathogen, *Cercospora sojina*. The fungus overwinters on soybean plant residue and seeds, and during the growing season, it can be spread across fields by wind and rain. Long periods of wet weather during the growing season favor disease development. Several management practices can combat this disease, including planting available FLS resistant varieties, crop rotation with a non-host (like corn), tillage (only as necessary), and application of foliar fungicides. After scouting to determine whether a foliar fungicide application is needed, it is best to select products that use active ingredients with different mode of actions to delay development of fungicide resistance. Although fungicides with single-site mode of action in the QoI (Strobilurin) group were historically the most effective for FLS management, fungicide resistance to these products now appears to be widespread in Nebraska.



Figure 1. Characteristic “frog eye” spots caused by the frogeye leaf spot (FLS) pathogen, *Cercospora sojina*, on a soybean leaf and pods. These samples were collected from Burt County in 2020. Fungicide resistance in this pathogen may reduce the efficacy of single-site QoI Group 11 fungicides.



Figure 2. In 2020, we collected FLS samples from 128 fields in 48 counties shaded in blue. Among the 375 *Cercospora sojina* tested, none were identified as sensitive to QoI fungicides in our laboratory assay. Confirmation of fungicide resistance with a DNA-based test is currently underway.

We collected 113 FLS samples in 2019 from 12 fields in 10 counties in Nebraska and determined all but two of the FLS samples were resistant to QoI fungicides. To understand whether or not these were isolated cases, we expanded our sample collection in 2020 and found that among 375 samples collected from 48 counties (Figure 2), we were unable to identify *C. sojina* that had a sensitive reaction to QoI fungicides in the laboratory, suggesting that QoI fungicide resistance is widespread in Nebraska. We are currently conducting research to confirm these results using DNA-based tests.

To improve our ability to communicate information about best practices for disease management to limit fungicide resistance, we recently developed an informational survey to find out how fungicide application decisions are made and identify sources of information used to make disease management decisions. This is a producer- and applicator-focused research survey to obtain information about foliar fungicide use in Nebraska. The survey includes 10 questions with both multiple choice and short answer questions that takes approximately 10 minutes to complete. If you are a soybean producer, farm manager, Extension

personnel, crop consultant, agronomist and/or other agribusiness representative helping manage soybeans, then we ask that you consider completing the survey (Figure 3). Participation is voluntary. You need to respond to the survey only once. If you have recently completed this survey, you do not need to respond again. Results of this survey will help us understand the factors affecting decisions to apply foliar fungicides on soybeans in Nebraska and will be used to better customize future Nebraska Extension education programs and limit the emergence of FLS fungicide resistance in Nebraska.



Figure 3. We are conducting a survey to understand how decisions apply to a foliar fungicide use for soybean disease management are made in Nebraska. To participate, scan the QR code above with your smartphone or visit go.unl.edu/soy21. **This survey is open until May 15, 2021.**

SOYBEAN GALL MIDGE UPDATE

By Justin McMechan, Assistant Professor, Department of Entomology, University of Nebraska–Lincoln

With two years of field research behind us, it's clear that the battle with soybean gall midge is unlikely to end anytime soon. For some soybean farmers, the 2020 season was a realization of the potential devastating impact that soybean gall midge can cause in east-central Nebraska.

Field surveys in Nebraska, through support from the Nebraska Soybean Board (NSB) and the North Central Soybean Research Program (NCSRP), found that soybean gall midge had expanded its range west in Nebraska with an increase in the frequency of infested fields, as well as plant injury in counties with historical presence of the midge.

Similar to 2019, soybean gall midge adults were first captured on June 10th in Cass County near Louisville, NE, with rapid emergence across the trapping network, which covers four states. Unlike 2019, 2020 adults emerged from last year's soybean fields for a longer period of time with an average of 25 days and a significant overlap in emergence between

this year and last year's soybean field.

Strong support from the NSB, the NCSRP and industry partners allowed for an evaluation of a wide range of tactics against soybean gall midge. These tactics were put under significant pressure due to the long duration of adult emergence. The findings from these studies include:

- ▶ Reduced efficacy from foliar insecticides was observed in 2020 relative to 2019
- ▶ Seed treatments showed early season potential but didn't translate to final yield
- ▶ A first-year study of a granular t-band application of Thimet 20G at planting showed significant potential to reduce larval number and plant injury
- ▶ Delayed planting of soybeans, a tactic that showed promise in 2019 was unable to escape infestations in 2020
- ▶ Some uninfested lines were observed in a test of 765 accession lines in a U.S. soybean germplasm study (not

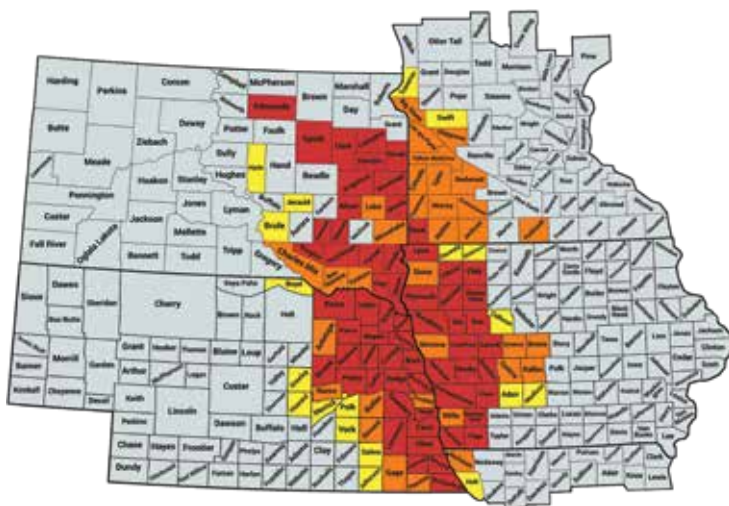


Field with significant plant injury and death from soybean gall midge taken in Lancaster County, August 2020.



Soybean stem infested with soybean gall midge larvae taken in late June in Saunders County, NE, about 15 days after first adult emergence.

Map showing counties with presence of soybean gall midge in 2018 (red), 2019 (orange) and 2020 (yellow).



commercially available), however, these lines may have simply escaped adult infestation. As the plot size of those lines are increased, soybean gall midge adults may infest those lines.

Soybean farmers should be cautious in adapting any tactics with only one year of data. Thimet 20G showed significant potential, but it is unclear what interactions it has with planting date and environmental conditions.



For the latest information on gall midge and to get alerts, go to soybeangallmidge.org.

ACCELERATING SUCCESS ON YOUR FARM

Nebraska On-Farm Research Network (NOFRN) provides an opportunity for growers to formulate questions and answers about their own fields. On-farm research can provide a great avenue to accelerate learning about topics that impact farm productivity, profitability and sustainability.

It is research that you do on your field, using your equipment and with your production practices. This means, the research is directly applicable to your operation.

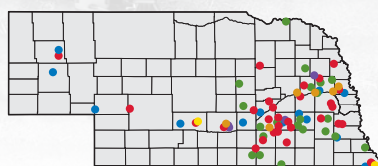
In 2020, there were 89 studies completed. Despite the challenges presented with the Covid-19 pandemic, NOFRN is very pleased with the ability to maintain a high number of studies and participating producers.

Studies and topics include nutrient management, pest control, irrigation strategies, conservation programs, new technologies, soil amendments, cultural practices and hybrid and variety selection. Research comparisons are identified and designed to answer producers' production questions. Project protocols are developed first and foremost to meet individual cooperator needs.

Farming is a complex business that demands life-long learning and a systems approach to solving problems. On-farm research is an important, timely and powerful part of providing systems-based solutions.

Nebraska growers, consultants, advisors and industry employees who attended

2020 STUDY LOCATIONS



- COVER CROPS
- CROP PRODUCTION
- CROP PROTECTION
- EQUIPMENT
- FERTILITY
- NON-TRADITIONAL

the 2020 On-Farm Research update meetings valued the information gained at **\$17.2 million**.

Things to Know About NOFRN

- ▶ Replicated and randomized treatments will be implemented using grower equipment.
- ▶ Experimental design will be used to manage natural and manmade field variables.
- ▶ Statistical analysis will be used to determine the significance of treatment differences.
- ▶ Training and consultation will prepare soybean (and corn) producers to implement high-quality research and leverage precision ag technologies in conducting research.
- ▶ Producers will gain skills in drawing valid conclusions and sharing research results with peers.
- ▶ Research results will be made broadly available and easily accessible using digital technologies.

2020 Nebraska On-Farm Research Results:

Apply last year's findings to this year's growing with the 2020 Nebraska On-Farm Research Results report. Read up on:

- Impact of Soybean Seeding Rate (Pages 14-20)
- Soybean Maturity Groups (Pages 22-27) **including a multi-year summary*
- Impact of Soybean Seeding Rate, Planting Date and Foliar Fungicide and Insecticide applications (Pages 28-33)
- Rye Cover Crop Seeding Rate Effects on Soybeans (Page 121)
- Soybean Seed Treatments for Sudden Death Syndrome (Pages 188-191)
- Fungicide and Insecticide Application on Soybeans (Page 193)

The web version is now live. Download, read the report and watch videos about these projects at: cropwatch.unl.edu/farmresearch/farm-research-result-publications



I would highly encourage farmers to do on-farm research of some kind, either something you have thought about or a wild, crazy idea. — **DON BATIE, BATIE FARMS**

If you are interested in participating in the NOFRN, contact your local Nebraska Extension educator or Laura Thompson, extension educator and on-farm research coordinator, at 402-245-2224 or laura.thompson@unl.edu.

A GROWING PROBLEM

Through the SCN Sampling Program, UNL researchers are encouraging continued soil testing to help farmers manage the pest's populations.

The University of Nebraska-Lincoln's (UNL) Plant and Pest Diagnostic Clinic is at the center of Nebraska's ongoing struggle with soybean cyst nematode (SCN), processing soil samples, counting eggs, sending results and distributing sampling materials to county extension offices.

Kyle Broderick, coordinator of the clinic, said that testing indicates that SCN—already a major pest for soybean farmers—isn't slowing down.

"Soybean cyst nematode continues to be a problem for growers across the eastern two-thirds of the state," Broderick said. "Every year, we have farmers with substantial infestations that had not previously been identified. In addition to the yield loss associated with high populations of SCN, resistant varieties may not be as effective."

The Nebraska Soybean Board (NSB) has backed the clinic's SCN Sampling Program to help the state and soybean farmers glean insights. Additional testing and registering where SCN has been found is the key to keeping a pulse on the spread and severity of the pest.

"The largest impact of the SCN Sampling Program funded by the NSB is proper identification of fields infested with the nematode by periodically collecting soil samples. This not only helps identify fields that have not previously tested positive for SCN but also provides insight on how effective growers are managing SCN populations," Broderick said. "SCN lacks above-ground symptoms and can go undetected in a field until nematode populations reach damaging levels.

Cysts can be easily dislodged from the root system as well, so collecting a soil sample is the only way to accurately detect SCN. Identifying fields infested with low levels of SCN makes it easier to manage that pathogen and increases the effectiveness and lifespan of resistant varieties."

As part of its comprehensive SCN Educational Program, the clinic is helping Nebraska's farmers understand SCN's scope. Broderick said his team has processed nearly 11,000 soil samples and that the program is responsible for identifying SCN in 32 of 59 counties in Nebraska where the nematode has been reported.

In 2020, Broderick and his team processed 459 soybean samples from across the state. While most of the fields tested negative for SCN, over 25% were positive. The highest population—85,760 eggs per 100 cubic centimeters of soil—was found in Antelope County. Many SCN populations in Nebraska are overcoming the most common source of resistance, PI 88788, which is found in more than 90% of SCN-resistant varieties.

As farmers and plant researchers alike try to get their arms around the SCN issue, continued testing—which is recommended post harvest—is the best approach.

"The most important step in managing any plant health issue is to correctly identify the problem," Broderick said. "When clients submit samples to the Plant and Pest Diagnostic Clinic, we can easily check for SCN in addition to looking at any other root diseases."

Strategies to Manage SCN

from UNL Professor and Extension Plant Pathologist Dr. Tamra Jackson-Ziems



1 | Rotate, rotate, rotate.

"Rotate infested fields with a nonhost crop, such as corn. The number of SCN eggs are expected to decline 50–75% in the first 1–2 years of corn production—but will never reach zero.

"Rotate sources of resistance when selecting SCN-resistant soybean varieties. Most SCN-resistant varieties are derived from PI 88788, but in Nebraska, about 50% of SCN populations can already reproduce on PI 88788. Select SCN-resistant varieties with resistance from another source, such as Peking or PI 89772.

"Rotate soybean varieties. If you can't find a soybean variety with a different source of resistance to SCN for your location, at least switch varieties."



2 | Look for seed treatment options.

"In addition to selecting the best SCN-resistant variety for your farm and rotation, you also have several seed treatment nematicide products available. These products may provide some additional protection and can increase yield 1–5 bushels per acre, based on the results from Iowa State University."



3 | Don't overlook winter weeds.

"Remember weed management as several common winter annual weeds are hosts for SCN and can allow them to infect and reproduce to higher population densities—even when there's no crop in the field. Winter annuals henbit and purple deadnettle are strong hosts for SCN. Field pennycress, shepherd's purse, small-flowered bittercress and common chickweed can also be hosts for SCN."



Learn more about Nebraska's SCN research at TheSCNCoalition.com and CropWatch.UNL.edu.

Bringing the Research to Farmers

The Soybean Research & Information Network continues to be your source for checkoff-funded research.

Checkoff-funded research projects and information at national and state levels can be found on the Soybean Research & Information Network (SRIN) website.

Each curated summary and highlight on the site is designed to benefit the farmer and promote further exploration. After engaging with the research highlight, viewers can find the related research at the National Soybean Checkoff Research Database. Farmers can learn more about specific projects and initiatives, while getting familiar with the researchers themselves.

- ▶ Read summaries and highlights of the latest research
- ▶ Explore topics like agronomics, soybean diseases and soybean pests
- ▶ Discover resources and research publications
- ▶ Engage with videos and social media channels

Farmer, and board member on both the Nebraska Soybean Board and North Central Soybean Research Program, Richard Bartek, says that the site is a great tool and resource for farmers, especially during scouting season. “Conveying research topics in this format is incredibly helpful to our operation, especially when we are in pest and disease scouting season,” says Bartek. “I am easily able to access information on Nebraska pests,



weeds and diseases, while taking note of what other research is being done across the country.”

Farmers, crop advisers, researchers and industry professionals are encouraged to visit the SRIN website frequently and subscribe to the weekly digest email to learn about updates on the site.

“As time goes on, we find resistance to weeds and insect problems that we never had before,” continues Bartek. “Research brings higher-yields and more profitability for soybean producers in general. The information is also timely and unbiased. The SRIN website is a tool I can rely on to make proper management decisions and puts me in contact with top-notch experts in the industry.”



Richard Bartek

NEBRASKA SOYBEAN BOARD

CURRENT FISCAL YEAR CHECKOFF INVESTMENT IN PRODUCTION RESEARCH **\$2,415,000**

**TOP RESEARCH FUNDING AREAS**

- Soybean Breeding and Genetics for Improved Yield, Immune Systems and Seed Protein
- Enhancing Soybean Germplasm Through Biotechnology
- Extension Educational Outreach Efforts

**RECENT INNOVATIVE RESEARCH PROJECTS**

- Improving Soybean Germplasm for Aquaculture Feed
- Soybean Gall Midge Management
- Nitrogen Management for Irrigated Soybeans in Western Nebraska
- Soybean Stem Borer – Search for Genetic Resistance

**TOP THINGS FARMERS SHOULD KNOW ABOUT CHECKOFF DOLLARS INVESTED IN RESEARCH**

Research information helps soybean growers maximize productivity and profitability through smart production choices and efficient use of resources. Another initiative is providing research-based educational opportunities to producers that are timely, unbiased and aid in farm management decision making.

**TOP AREAS OF RESEARCH CRITICAL TO THE FUTURE OF NEBRASKA'S SOYBEAN PRODUCTION**

- Optimize Annual On-Farm Yield Improvements from 0.5 to 1.0 Bushels/Acre a Year
- Stop the Decline in Seed Protein that Accompanies the Rise in Soybean Yield
- Continue the Focus on Genetic, Chemical and Organic Control of Insects, Diseases and Weeds

Sweet Success

One of the Biggest Success Stories in Nebraska as a Result of Research:

Nebraska's soybean breeding program is well-established and extensive. Over the last decade more than \$7.5 million has been invested in soybean breeding and genetics from the state's checkoff funding alone. Seed scientists are devoting their time and knowledge to increase soybean varieties and improve their immunity and tolerance to chemicals, drought, pests and more.



SOYBEANRESEARCHINFO.COM

Funded by the soybean checkoff



Questions

WITH DR. GEORGE GRAEF

Dr. George Graef

Our Q&A with the renowned soybean breeder and University of Nebraska Presidential Chair in Soybean Breeding dives into his current research.

In 2013, the Nebraska Soybean Board (NSB) endowed the Presidential Chair in Soybean Breeding at the University of Nebraska–Lincoln (UNL), and Dr. George Graef—a world-class soybean breeder and member of the university's Department of Agronomy and Horticulture—has held the position since its inception. The NSB-funded endowment supports focused soybean research directed by Dr. Graef.

In a recent Q&A, he shared how his research, which aims to improve yield and develop new soybean traits, is discovering innovations for Nebraska soybean farmers.

Nebraska Soybean Board (NSB): What is the importance of the University of Nebraska Soybean Breeding program?

George Graef (GG): Our primary focus is on Nebraska soybean production systems and the constraints Nebraska producers face, which may limit production and profitability. Our research also includes a major emphasis on yield per acre. Farmers need protection for that yield, so we work to improve resistance to important biotic stresses like soybean cyst nematode (SCN) and phytophthora root rot, as well as significant abiotic (environmental) stresses like a response to water and iron-deficiency chlorosis (IDC).

There are over 5 million acres of soybean production in Nebraska, which is at the western edge of soybean production in the U.S. Nebraska soybean producers have unique needs and opportunities that differ from areas to the east. At the same time, soybean lines developed in Nebraska can perform well across the north-central region. Our access to irrigation and high-yield environments improves identification of new soybean lines with superior yield potential.

NSB: What kind of benefits and ROI will farmers see from the breeding program?

GG: There are a few different ways that outputs from the soybean breeding program can impact ROI for soybean farmers:

- ▶ One impact is the results from our research that improve breeding information and methods to increase the rate of genetic gain for our breeding program and others.
- ▶ A second way that our work could impact ROI for farmers is to offer alternative, high-value marketing options that include things like high-oil soybeans; high-protein soybeans; or even just non-GMO options that, in many markets, offer a premium to the farmer and contribute to genetic diversity in their on-farm crop rotations and opportunities to incorporate different herbicide modes of action to help manage herbicide-resistant weeds.
- ▶ A third way that farmers realize ROI from our program is through the impact of Nebraska-developed soybean lines on commercial, university and USDA programs throughout the U.S. Nebraska-developed soybean germplasm contributes to new soybean varieties available to farmers through these other channels.

► Finally, direct commercialization of new soybean cultivars from our breeding program impacts farmers directly by their use and, based on acreage estimates, returns more than \$60 million per year to farmers at the first point of sale.

NSB: How do commercial lines play into the project?

GG: Most commercial lines carry herbicide-resistance traits that involve legal issues, not only for the trait(s), but also for the purity of the material in our program and the outside material. Adventitious presence, or the presence of unintended events in any material (whether that is our conventional non-GMO lines or other traitled lines), is a major concern. We focus our efforts on high-yield, high-quality lines with superior performance in Nebraska and across the north-central region. What we do complements commercial efforts without duplicating them. That makes the best use of our limited resources and has the highest impact on what we do.

NSB: Is there any upcoming information farmers should know about the breeding program?

GG: We continue to see great new lines coming through the program. We have excellent resistance to SCN and a proven background of resistance to phytophthora root rot. There's a whole wave of material with improved seed composition—higher protein meal, ultra-high protein meal for high-value applications and high-oil lines with superior yield that would be useful for the incorporation of specific oil traits, which may increase value.

Producing soybean seeds with improved compositional quality is particularly important in Nebraska because nearly two-thirds of Nebraska's soybeans enter the export market. We have lines that are more efficient users of water, providing greater yield per unit effective water received. It's important for Nebraska producers, because about half of the soybean production acres are irrigated, so if irrigation timing and amount can improve efficiency and provide the same or better yield with less water applied, that's ROI for the farmer. The improved yield per unit water also contributes to the sustainability goals with

more efficient use of irrigation water and the energy required to apply it. Increased water use efficiency saves water, an important limited natural resource, and also saves energy needed to pump and deliver that water over the season. For producers who are in rain-fed production systems, those soybean varieties that can use the available water more efficiently to translate that into seed yield are also the ones who will be most profitable in the rain-fed systems over time.

NSB: Through the winter nurseries you are tending to in Chile and Puerto Rico, how is that research further amplifying the genetic traits created for Nebraska producers in the coming years?

GG: The off-season nurseries allow us to obtain four additional generations each year, which accelerates progress by shortening cycle time and increasing the number of new genotypes or lines we can develop and evaluate each year.

The Puerto Rico nursery allows us to have two generations under lights. We can grow the F1 plants from our summer crossing in Nebraska (September–January) and have a crossing block to develop new crosses based on the most recent year's performance data (January–May). We also have two seasons of generation advance in the unlighted fields, from October–January and February–May.

The Chile nurseries allow evaluation of several thousand new plant rows each year, as well as small increases or purification blocks to accelerate seed production of a promising new variety. We also conduct experiments using a managed stress environment with drip irrigation in Chile. The area where we grow soybeans normally receives no rain during the season, so all the water that the plants receive is provided through irrigation. That's the normal production system in that region, with water coming from snowmelt in the mountains. We can use that to evaluate soybean response to water stress at different critical growth stages. The information is useful to help identify genes involved in the response, as well as to identify lines that have greater productivity per unit of effective water received.

NSB: As the NSB Presidential Chair in Soybean Breeding at UNL, what kind of recent opportunities and successes have been coming from this endowment?

GG: I'm grateful to the NSB for establishing the endowment, and I am honored to provide stewardship of that gift. We've used the support to enhance our overall program and to support new initiatives and collaborations benefitting Nebraska soybean producers.

One exciting development is that we made breakthroughs in new soybean lines with an improved balance of protein, oil and soluble carbohydrates. We have soybeans that allow processors to get 12 pounds of oil per bushel and still produce a 48% protein meal. Most soybean cultivars in the north-central U.S. don't make the 48% meal target. The high-protein meal is important for the main users of soybeans—poultry and hog producers. Importantly, we showed no significant decrease in yield with the improved protein and oil composition lines.

NSB: What would be your message to producers who pay into the checkoff and how is the research you are doing helping the next decade of agriculture in Nebraska?

GG: Thank you for supporting the soybean checkoff and all of the activities it allows. I have the privilege of attending most of the quarterly meetings of the NSB, and I am so impressed with the dedication of all the board members and how hard they work creating new opportunities and improving existing ones for soybean producers.

Farming has always had its uncertainties. The next 10 years and beyond may see those uncertainties amplified with more unpredictable and extreme weather patterns. Who can predict future policies and markets? We are working to identify how genetics and breeding can contribute to the increased stability of production in the future. We'll need to continue increasing production to meet future demand, but we also need to maintain and improve nutritional quality. There are a lot of revolutionary things happening in agriculture and food production right now. It promises to be an exciting time!

MAKING THE BLACKTOP...



The Nebraska Soybean Board (NSB) is funding research for using soybean oil as a sustainable recycling agent in asphalt pavements.

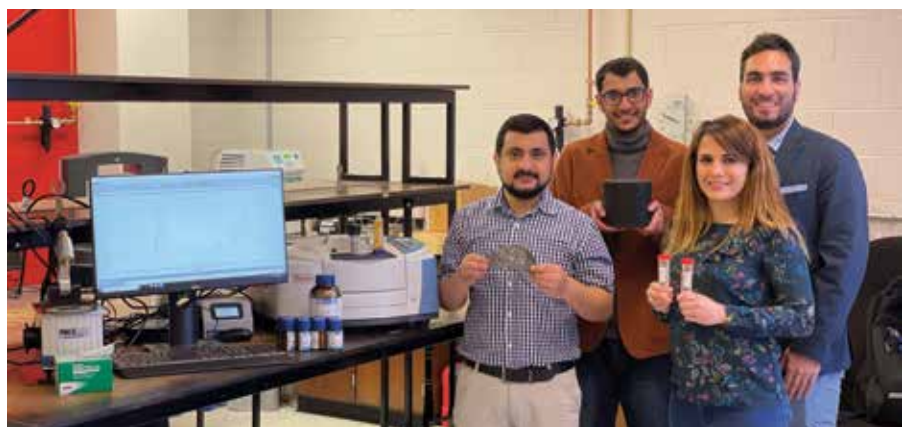
Thanks to researchers and engineers at the University of Nebraska–Lincoln (UNL), a possible new use for soybean oil is on the way. The aim of this research study is to evaluate the effect of soybean oil—a locally available, affordable and environmentally friendly recycling agent—on the performance of asphalt pavements containing recycled materials.

Asphalt recycling is the process in which reclaimed asphalt pavement (RAP) materials are combined with new materials and a recycling agent, to produce hot mix asphalt (HMA) mixtures. Both batch and drum-type hot mix plants are used to produce a recycled mix. The RAP material can be obtained by milling or ripping and crushing operation. The mix placement and compaction equipment and procedures are the same as for regular HMA.

Recycling is one of the several alternatives available for rehabilitation of pavements. Other methods include overlay and complete removal and replacement.

Recycling is increasingly being used because of the following advantages:

- ▶ reduced cost of construction
- ▶ conservation of aggregate and binders
- ▶ preservation of existing pavement geometrics



UNL's Dr. Hamzeh Haghshenas (far right) and the team of Nebraska researchers and engineers working on the asphalt project.

- ▶ preservation of environment
- ▶ conservation of energy

The project, now in its second year, is focusing on the long-term performance, moisture resistance and thermal behavior of asphalt binders modified with the soybean oil.

“As a farmer, these kinds of projects and initiatives are really important,” said Nathan Dorn, farmer and chairman of the NSB research committee. “We are finding ways to increase demand for our soybean oil, while supporting a method that decreases our environmental impact and benefits taxpayers and those that utilize and drive on asphalt pavements.”

The outcomes of this research will ultimately work to provide a new use for soybean oil and create an expanded soybean oil market. For example, the

Nebraska Department of Transportation (NDOT) is planning to use high percentages of RAP (up to 65%) with these new technologies (i.e., recycling agents). The preliminary test results show that 6% of vegetable-based recycling agent based on the total weight of asphalt binder must be added to asphalt pavements containing 65% RAP.

Nebraska produces two million tons of asphalt mixtures every year containing 5.5% asphalt binder, which means 6,600 tons of soybean oil will be consumed annually just for NDOT projects alone—probably about twice that for all asphalt paving in Nebraska. The possible use of soybean oil will provide a safer, trustworthy and more comfortable means of transportation while bringing significant cost savings, providing longer-lasting and more sustainable asphalt pavements.

A CHANGE IN MANAGEMENT

Nebraska on-farm research has proven the benefit of cover crops and the need to strategically integrate them into farmers' field management plans.



Dr. Katja Koehler-Cole

After six years of implementing and analyzing research funded by the Nebraska Soybean Board (NSB), Dr. Katja Koehler-Cole knows cover crops can greatly

enhance the microbial activity in soybean fields around the state—if given appropriate attention.

“One thing we learned is that we need to treat cover crops more like a cash crop,” said Dr. Koehler-Cole, a research assistant professor for the University of Nebraska-Lincoln’s Department of Agronomy and Horticulture. “That may require some changes in management. We should optimize cover crop management for biomass production, both above-ground biomass (shoots) and below-ground biomass (roots).”

The timing, too, has to be just right. Often in Nebraska, cover crop planting happens too late and termination too early. Dr. Koehler-Cole suggested broadcasting them into a standing crop in late summer and leaving them in fields longer for maximum impact. “Planting green—in other words, planting into a living cover crop before it is killed—can delay termination giving cover crops more time to grow roots and shoots.”

From there, cover crops’ benefits are many: protecting from soil erosion, potentially reducing herbicide treatments and controlling herbicide-

resistant weeds and generating higher levels of microbial activity.

Upon termination, a cover crop’s biomass becomes a food source for microbes in the soil. Growing those populations, particularly fungi, helps improve a field’s overall stability, water infiltration and water storage—reducing risk of erosion. Keeping nutrients in the soil and increasing organic matter sets the stage for greater nutrient use for main crops.

When considering what cover crop(s) to plant in fields, researchers have explored mixes—which can provide more ecological benefits than a single-species cover crop—consisting of grasses, legumes and brassicas. Each has their own advantages: grasses take up excess nitrogen and help prevent erosion, legumes improve biomass quality and correct nitrogen levels and brassicas excel in suppressing weeds and some soil pathogens while making palatable forage. Deploying a mix, however, requires choosing those with compatible management practices. Single-species cover crops are still a viable route.

“In my experience, for corn–soybean rotation in Nebraska—where cover crops are planted in September or October—pure-planted cereal rye is still the best choice,” Dr. Koehler-Cole said. “Pure-planted legumes barely produce biomass during the short growing season in this rotation and brassicas winterkill. Planting them in a mix will result in even less biomass, because they are planted at lower seeding rates.”

“

Improving soil health is still the most common goal for cover crops but we are learning more about the central role soil biology plays in soil health. What we are doing with cover crops is basically feeding and housing soil microbes.”

— DR. KATJA KOEHLER-COLE, UNL RESEARCH ASSISTANT PROFESSOR

”

UNL researchers have spent significant time exploring cover crops’ impact on Nebraska farms. Dr. Koehler-Cole’s colleagues have analyzed everything from how cover crops can help with weed control (reducing the frequency of herbicide treatments) to using aerial imagery to see the visible impact of cover crops on the vigor of cash crops.

Looking to the future, Dr. Koehler-Cole sees the strategic use of cover crops evolving to help farmers achieve specific field management goals.

“Cover crop usage will likely increase, but we may see a more targeted approach with cover crops,” she said. “This means selecting a cover crop to obtain a specific, narrow goal such as a nitrogen-scavenging winter rye cover crop in an area with high groundwater nitrate concentrations. Planting cover crops on erodible ground instead of the whole field is another example for a more targeted approach.”



Visit CropWatch.UNL.edu/cover-crops to read about additional UNL cover crop research, including cover crop recipes, carbon sequestration benefits and more.

DATA FUNDAMENTALS



TECH TOOLSHED

Tech Toolshed is a soy checkoff resource to help you maximize the technology you currently have, integrate new technology and manage the vast quantity of data available.

GOAL

After reading our section, the grower should have a basic understanding of how on-farm data can be used to generate value and understand types of data, data usage complications and basic data management considerations.

VALUE STATEMENT

By understanding the fundamentals of on-farm data, the grower may improve efficiencies, enhance input allocation, improve on-farm practices and inform new decisions or insights. In addition, they will be able to understand how data is being generated on their farm, how data flows to and from third party constituents and how data compatibility affects their operation.

By Elizabeth Hawkins, Ajay Sharda, Ignacio Ciampitti, Bruce Erickson, Joe Luck, Daniel Barker, John Fulton, Jenna Lee, Richard Colley III and Scott Shearer

AG DATA 101

Precision agriculture enables farmers to collect not only field-based information, but site-specific data enabled by the Global Positioning System (GPS). Data allows farmers to—within their operation—create information and support on-farm decisions. As time and technology have evolved, connectivity and cloud technology have provided portability and access to data by farmers and their trusted advisors.

On the farm, technology adoption has increased significantly over the last decade. Many producers have turned to technology as a means to become more efficient, reduce workload and store/analyze production data. All levels of technology adoption exist across the realm of agriculture and adoption level is usually determined by farm size, technological expertise and amount of investable capital.

In most cases, data usage is implemented with the goal of making some type of informed agronomic and farm business decision. This process usually starts with the collection of data, then some form of data visualization or analytics that provides either previously unknown information or a recommendation (3rd party) then the producer is able to make an informed decision.

DATA VALUE

Data usage in agriculture has been proven to hold value. There are many applications where data—and the decisions made from that data—can directly benefit the producer's bottom line. This value stems from large collections of farm data that are being used by farmers, companies and government agencies to aid in decision making related to crop production and management practices, as well as better predictions around nutrient and water availability. It is important to understand what value all of this farm data provides to the producer.

DATA TYPES

Data collected for use in agricultural settings can come from a variety of sources and be used for multiple applications. Some of the types of data currently used in commercial agriculture are displayed below.

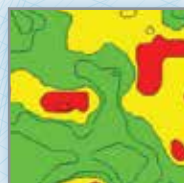
Figure 1. Agricultural data types.



AGRONOMIC



MACHINE



PRESCRIPTION



REMOTE-SENSED



PRODUCTION

DATA HURDLES

DATA COMPATIBILITY

Interoperability is the ability of a system or product to work with other systems or products without special efforts of the user. An example includes connecting a data stream between a brand A tractor with a brand B planter and this is far from being the only situation that demonstrates this particular issue. Another consideration is portability—the capacity to move, copy or transfer data easily between environments securely without affecting usability of the data.

DATA FORMATS

Proprietary formats, (such as .dat, .gsd, .rbin, or .agdata) for storing data and for data exchange between field machinery and farm management software can add an additional hurdle to on-farm data usage. Some open source file formats such as .txt, .shp, and .xml are available and can facilitate easier implementation of data on the farm. This wide range of data formats that are commonly used, but not necessarily interchangeable, may make it challenging to analyze data in a single space. Make sure to evaluate various digital tools and services for their ability to interpret and visualize these file formats.

DATA IMPLEMENTATION

Data often follows a common flow. Of course, data is first collected often with some type of technology. The producer will then upload this farm-level and personal data. While some producers may choose to manage their own data, it is more common that an Agricultural Technology Provider (ATP) will aggregate the farmer's data, combine it with other relevant data sets and apply algorithms to analyze and visualize it. The ATP then gives the farmer a customized solution or recommendation based on data received. Using the recommendations provided by the ATP, the farmer can then use actionable information to make on-farm decisions.

DATA FILE COMPONENTS

Site-specific data files are often comprised of many georeferenced points that contain various attributes related to the field operation or site-specific characteristics of the field.

One important concept to grasp is that these collected data points often have more information than is visualized by a single map. Attributes for each of these points that are commonly collected are shown in Figure 2. Certain farm management software can be used to maximize the value of data usage.

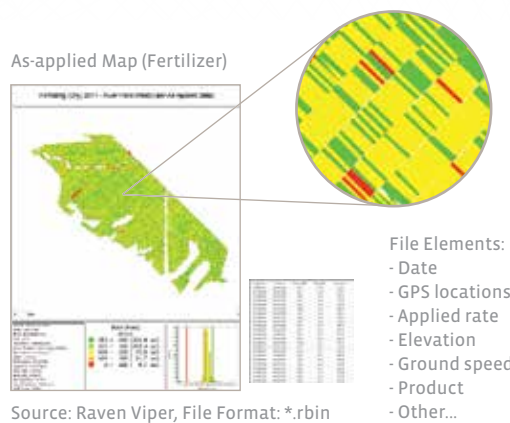


Figure 2. Understanding that an ag data file represents many site-specific attributes is an important part of data fundamentals.

DATA STORAGE

Storing data is a critical part of using data effectively. Data should be archived in both an on-farm and off-farm storage location (i.e., on the cloud) to ensure that there is a backup that can be accessed in any scenario. Data should be organized in a way that considers long-term data stewardship. At the very least, data should be organized by year, and then by crop, field or farm as appropriate for the operation.

RESOURCES

Ohio State Precision Ag – Big Data Webpage
<https://fabe.osu.edu/programs/precisionag/bigdata>

Alabama Cooperative Extension System – Data Management at the Farm Level
<http://www.aces.edu/pubs/docs/A/ANR-2057/ANR-2057.pdf>

Precision Farming Dealer – Does Your Co-Op Own Your Farm Data?
<https://www.precisionfarmingdealer.com/blogs/1-from-the-virtualterminal/post/1417-does-your-co-op-own-your-farm-data>

Ohio State Fact Sheet – The Data Ownership Confusion
<https://ohioline.osu.edu/factsheet/fabe-55201>

American Farm Bureau Federation – Ag Data Transparency Evaluator
<https://www.agdatatransparent.com/>

AgGateway – Agriculture Glossary
<https://aggateway.atlassian.net/wiki/spaces/G/overview>



For more information and links to additional resources, visit www.unitedsoybean.org/techtoolshed

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ABC IS READY TO USE FOR 2021 CROP BUDGETS



The University of Nebraska–Lincoln's Department of Agricultural Economics invites you to use the online Agricultural Budget Calculator (ABC) program as you prepare your 2021 crop budgets and beyond.

The new program allows producers to estimate their cost of production based on field operation expenses, machinery, labor and material inputs. In addition, revenue projections are included to assist users in determining projected net returns above costs. The University of Nebraska annual crop budgets are available in the system to draw information from, with individual UNL crop budgets available for download and use in the system. A livestock enterprise budget module will be added in the coming months. Other ABC program components planned include a whole farm cash flow budget, a risk module, breakeven price and yield analysis, plus more.

The University's crop budgets, historically available as Excel files, have always been

intended as guides for producers to follow along with and to understand the cost factors that make up cash and economic cost of production. Now, technology allows users to enter their data online and produce financial reports and enterprise budgets in this new system

Learning to use a program, like the new Ag Budget Calculator, will assist you in customizing your farm and ranch enterprise budgets.

Please register at farm.unl.edu/abc-beta-tester-application to get the program link.

Several weeks after you receive the program link and have had a chance to use it, you'll receive an online questionnaire to get your input on how the program is working and ask for your feedback on improvements that can be made to advance its usability.

The ABC program was initially funded by the Nebraska Soybean Board.



2021 Crop Budgets

The current UNL Crop Budget files are available in Excel and PDF formats on CropWatch. The University budgets are also available within the Ag Budget Calculator program to download into your ABC program account. After you download a budget, you can edit the information in field operations, yearly rates and prices and the materials and services input section to calculate your projected expenses. And ABC includes a revenue section. Entering estimated revenue into the program evaluates net returns above costs for the crop year.



Learn more about the program at farm.unl.edu/abc

For questions, contact **Glennis McClure** at gmcclure3@unl.edu or 402-472-0661

Glennis McClure, extension educator and farm and ranch management analyst, provides an overview of ABC's interface and functionality.

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