Investing in the future of farming

Minnesota Corn's research program

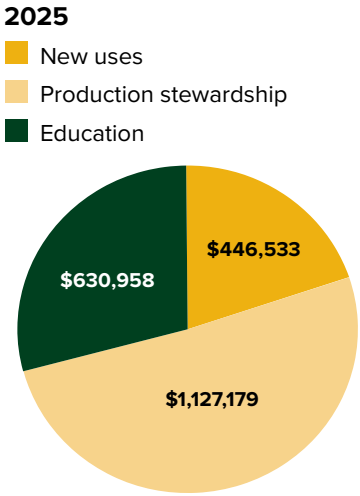
2025

Each year, as part of its mission to increase the productivity, efficiency, and sustainability of corn production, Minnesota Corn invests corn checkoff funds in on-farm and lab-based research projects.

In February 2025, the organization finalized its research portfolio for the year, allocating funding to 30 projects located in labs and test plots throughout the state. Most of the projects focus on increasing the productivity and efficiency of corn production. Several aim to develop new uses for corn and corn-based products.

The following are brief overviews of Minnesota Corn-funded research projects. Learn more about the research at **mncorn.org/research**.

Minnesota Corn Research Program Allocations



Annual allocations	Total
2021	$2,000,767
2022	$2,237,740
2023	$2,112,697
2024	$2,252,844
2025	$2,204,670
Total	**$10,808,718**

Minnesota Corn-funded research at the University of Minnesota Center for Sustainable Polymers aims to increase opportunities for corn-based plastics.

Education and outreach

Nitrogen Smart Programming (Ongoing)

Principal investigator: Brad Carlson, University of Minnesota (UMN) water resources extension educator

Overview: Nitrogen Smart is a University of Minnesota Extension farmer education program that highlights the latest information on nitrogen management. Thanks in part to Minnesota Corn, the 2025 Nitrogen Smart program will include in-person events and additional online resources, including podcast episodes and short videos. Another grant from Minnesota Corn will support the creation of new "advanced" Nitrogen Smart online courses focused on biological products and variable-rate nitrogen application.

The Nitrogen Smart program, led by University of Minnesota Extension Educator Brad Carlson (pictured here), is among the Minnesota Corn-supported efforts that can help corn farmers reduce input use while increasing efficiency.

University of Minnesota Extension water quality education (Ongoing)

Overview: This project funds a half-time water-quality Extension educator. In 2025, the Extension educator will continue educating Minnesota corn growers on the latest water quality research through presentations, articles, and online resources.

MAWRC/Discovery Farms research and education program (Ongoing)

Principal investigator: Warren Formo, executive director, Minnesota Agricultural Water Resources Center (MAWRC)

Summary: MARWC is a research and education organization aimed at helping growers and agriculture organizations address water quality issues. The center operates the Discovery Farms Minnesota program, which collects on-farm surface runoff and tile drainage data, and it hosts conferences to help growers learn about nutrient management and conservation practices. In 2025, MAWRC will continue operating a controlled drainage research and demonstration project at Farmamerica in Waseca. The project is evaluating the extent to which holding back tile drainage through a control structure limits tile flow and nitrogen losses.

Enhancement of Survey Efforts for Corn Insect Pests in Minnesota (Ongoing)

Principal investigator: Fei Yang, corn entomologist, UMN Extension

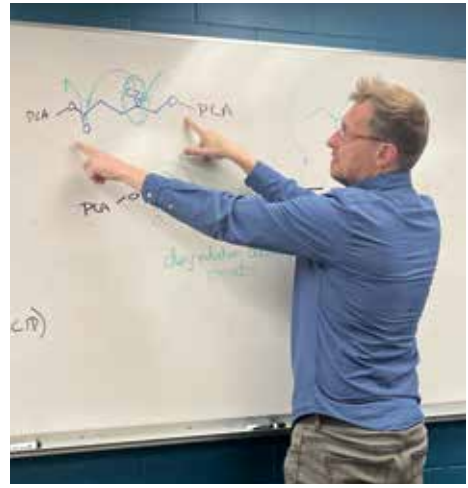
Overview: This project is a long-term effort to better understand trends when it comes to key corn insect pests. During the 2025 growing season, the researchers will use traps to monitor the prevalence of pests such as European corn borer, black cutworm, and corn earworm, and in the fall, they'll survey fields for European corn borer larvae. The goal of the project is to improve pest forecasting and fine-tune integrated pest management practices.

New uses

Engineering Degradability into Corn-based Plastics (Year 2)

Principal investigator: Thomas Hoye, professor, UMN College of Science and Engineering

Overview: This project aims to develop a new strategy to create more easily degradable versions of PLA plastic and other bioderived polyesters. Although PLA is compostable, that operation needs to be conducted in an industrial high temperature composting facility to proceed at a viable rate, and the material does not degrade readily in the environment.



Professor Ian Tonks gives an overview of the designer monomer that researchers are studying in the project.

Direct Conversion of Corn-Derived Carbohydrates to Jet Fuel via Methanol (Year 2)

Principal investigator: Paul Dauenhauer, professor, UMN College of Science and Engineering

Overview: This study is assessing the potential of a chemical process to convert corn to methanol. The process utilizes a catalyst to break apart the carbon-carbon bonds of corn-derived carbohydrates, ultimately yielding methanol which can be readily dehydrated to dimethyl ether. The research is evaluating two general strategies for catalyst design and the economics of the corn-to-dimethyl-ether production process.

Modeling production of SAF from corn ethanol and CO2 (Year 2)

Principal investigator: William Northrop, professor, UMN College of Science and Engineering

Summary: This research is exploring the potential for large-scale projects to combine captured carbon dioxide emitted from ethanol production to produce sustainable aviation fuel (SAF). Northrop is collaborating with the Chippewa Valley Ethanol Company plant in Benson to determine energy and cost benefits of generating SAF through waste carbon dioxide and ethanol.

Production and environmental stewardship

Increasing Maximum Return-to-Nitrogen Rates and Alternatives to Fall Nitrogen Applications (Year 2)

Principal investigator: Fabian Fernandez, nutrient management specialist, UMN Extension

Overview: This project is studying why corn farmers have needed more nitrogen to achieve higher yields in recent years than expected, based on past trial data. Researchers are exploring alternatives to fall nitrogen applications using polymer coated urea and subsurface banding.

Tracking nitrogen mineralization in Northwest Minnesota soils (Year 2)

Principal investigator: Lindsay Pease, nutrient and water management specialist, UMN Extension

Overview: This project is studying how soil texture, soil moisture, and nitrogen rate affect nitrogen availability and grain production. The researchers are planting corn plots at the University of Minnesota Northwest Research and Outreach Center in Crookston and using different rates of nitrogen for each plot. For each plot, they are evaluating soil nitrogen availability, soil temperature, soil moisture, corn yield, and other production metrics.

Insecticidal Seed Treatments for Managing Corn Rootworm (Year 2)

Principal investigator: Fei Yang

Overview: The researchers are studying the effectiveness of the various rates of insecticides in seed treatments at plots in Rosemount and Lamberton. They are also evaluating how the presence of Bt technology affects rootworm management.

Developing biocontrol against corn pathogens (Year 2)

Principal investigator: Devanshi Khokhani, assistant professor, UMN Department of Plant Pathology

Overview: This project is studying the effectiveness of seven different bacteria species at combating the pathogen pythium ultimum, which causes damping off and root rot disease in corn. The researchers hope to identify the compounds among the seven bacteria species that are responsible for combating pythium ultimum.

High-throughput gene platform for validating resistance against fusarium in corn (Year 2)

Principal investigator: Josiah Mutuku, group leader, 2Blades

Overview: The project is funding work by the nonprofit biotech organization 2Blades to engineer corn varieties that are resistant to the soil fungi fusarium, which can cause stalk and ear rot and mycotoxins. 2Blades has identified genes responsible for encoding proteins that control fusarium and reduce mycotoxin accumulation. The organization eventually hopes to transfer these genes into corn.

Optimizing corn-soybean rotation: Reduced tillage, varied irrigation, and cover crops (Year 2)

Principal investigator: Vasudha Sharma, irrigation specialist, UMN Extension

Overview: This project is studying how conservation tillage, cover crops, and different irrigation management strategies affect crop production, soil health, and nitrogen losses in Central Minnesota. The researchers are testing two tillage treatments, two cover crop treatments, and four water level treatments, gathering data on soil moisture, nitrate leaching, soil and plant nitrogen, soil physical properties, and biomass.

Past the learning curve: does soil health lower nitrogen requirements? (Year 2)

Principal investigator: Anna Cates, soil health specialist, UMN Extension

Overview: This project is studying how soil health practices such as cover crops and minimal tillage affect a corn crop's nitrogen needs. The researchers are working with growers who have implemented soil health practices on a short- and long-term basis as well as with growers who have not implemented the practices.

University of Minnesota Extension Irrigation Specialist Vasu Sharma explains a research project during a field day event.

European corn borer resistance to transgenic Bt corn in Minnesota (Year 3)

Principal investigator: Fei Yang

Overview: This project is studying the susceptibility of European corn borer to Bt proteins and the frequency of Bt resistance among European corn borer in Minnesota. It's also determining the genetic basis for that resistance. Results generated will provide essential data to assist growers in the management of European corn borer using Bt technologies within the state.

Is fixed ammonium a part of nitrogen cycling in soils (Year 4)

Principal investigator: Dan Kaiser, soil scientist and soil/ plant nutrient management specialist, UMN Extension

Overview: This project is assessing how corn responds to nitrogen at various levels of potassium fertilization. The project will determine how much fixed ammonium is present in soils, how fixed ammonium could be impacted by fixed potassium and vice versa, and ultimately whether fixed ammonium relates to the amount of nitrate present in the soil.

Dialing in the most profitable and environmentally responsible nitrogen rate (Year 5)

Principal investigator: Fabian Fernandez

Overview: This study is assessing the effects of various nitrogen rates on yield, economic return, nitrogen use efficiency, nitrate leaching in tile-drained fields, nitrous oxide emissions, and ammonia volatilization. From 2021 to 2024, the researchers grew corn on tile-drained plots in southwestern Minnesota using different nitrogen rates, measuring yield, volatilization, nitrate leaching, and nitrous oxide emissions. In 2025, they're growing soybeans on the plots but will continue to collect data on nitrogen losses. They'll use the data to create formulas for calculating yield and nitrogen losses based on nitrogen application rates.

Hyperstable enzyme to control plant diseases (Year 8)

Principal investigator: Mikael Elias, associate professor, UMN College of Biological Sciences

Overview: This project is developing an enzymatic spray that limits the virulence of the bacteria responsible for causing Goss' wilt. Previous field studies found that the enzyme dramatically reduced Goss' wilt when sprayed on infected corn leaves. The researchers are evaluating properties of the spray to facilitate its use and lower costs and determining the optimal time to treat plants with the spray.

Evaluating conservation practice effectiveness with a paired watershed approach (Year 7)

Principal investigator: Yuxin Miao, director, UMN Precision Agriculture Center

Overview: The project aims to quantify the effects of conservation practices on nitrate losses in drain tiles. For the previous four years, the researchers monitored tile drainage outlets on adjacent southern Minnesota watersheds. Beginning in 2025, satellite-based precision nutrient management will be introduced in one of the watersheds. Over the coming years, the researchers will test the water quality data of the calibration and treatment periods for evidence of nutrient reductions.

Graduate student Zac Aanerud collects nitrate water samples from tile drainage.

Hyperstable enzyme to control plant diseases (Year 8)

Principal investigator: Mikael Elias, associate professor, UMN College of Biological Sciences

Overview: This project is developing an enzymatic spray that limits the virulence of the bacteria responsible for causing Goss' wilt. Previous field studies found that the enzyme dramatically reduced Goss' wilt when sprayed on infected corn leaves. The researchers are evaluating properties of the spray to facilitate its use and lower costs and determining the optimal time to treat plants with the spray.

Innovation Grants

Since 2016, Minnesota Corn has offered Innovation Grants to farmers and researchers to explore practices that benefit air and water quality and study ideas to make corn farming more efficient and profitable.

Learn more about Minnesota Corn's Innovation Grant program, and how you can apply for a grant, at **mncorn.org**.

Designing Drainage Water Recycling to reduce nutrient loss, improve yields (Year 1)

Principal investigator: John Swanson, farmer, Polk County

Overview: This project will investigate the feasibility of implementing a drainage water recycling system in northwestern Minnesota. To optimize DWR potential performance, the project will focus on site-specific design parameters, such as storage capacity based on a calibrated digital elevation model, soil type, and crop water requirements.

Unlocking Corn Stover Hemicellulose: Biopesticide Carrier to Combat Plant Disease (Year 1)

Principal investigator: Lingling Liu, Assistant Professor, University of Georgia College of Engineering

Overview: This research is investigating the physicochemical properties of corn stover-derived nano-hemicellulose, including its morphology, interfacial behavior, and emulsion stabilization. The project will also explore its potential as an efficient nanocarrier for biopesticides, enhancing their encapsulation, sustained release, and overall efficacy.

Soil Management Strategies to Mitigate Impacts of Variable Precipitation (Year 1)

Principal investigator: Heidi Peterson, Vice President of Agriculture Research & Conservation, Sand County Foundation

Overview: This project will use on-farm, real-time soil moisture data that has been collected on 18 Minnesota farms between 2021 through 2023 to evaluate how agricultural management affects soil water content, soil structure, and the resilience of these systems to wet and dry periods. This proposal leverages existing data collected previously through a federally funded grant to further explore the interactions between soil management and key physical, chemical, and biological properties that are instrumental in building soil resilience and corn productivity.

On-Farm Evaluation and Improvement of Precision Corn Management System (Year 1)

Principal investigator: Neal Mensing, farmer, Blue Earth County

Overview: This research will study soil sensing-based variable rate nutrient management and compare satellite remote sensing-based precision nitrogen management to fixed-rate split nitrogen management. It will also assess the impact of early planting and dynamic termination on cover crop growth, nutrient uptake, and cash crop yield, and nitrogen management.

Scaling procyanidin-based denitrification inhibitors for climate-smart agriculture (Year 3)

Principal investigator: CheJen Hsiao, postdoctoral scientist, UMN Department of Soil, Water, and Climate

Overview: This project is studying whether the naturally occurring compound procyanidin can effectively limit the ability of soil microbes to convert nitrates into nitrous oxide and nitrogen dioxide, a process known as denitrification. While nitrogen dioxide is harmless, nitrous oxide is a long-lived greenhouse gas. This project aims to evaluate the feasibility of using a procyanidin product developed by the researchers as a soil amendment at the field scale.

Evaluation of variable-rate nitrogen in corn fields receiving manure (Year 3)

Principal investigator: Peter Anthony, farmer, Nicollet County

Overview: This project is studying how manure and cover crops affect the need for commercial nitrogen fertilizer in corn fields. Anthony will apply various rates of nitrogen in fields with manure application and/or cover crops to determine the optimal nitrogen rate. The results of the project will provide important guidelines for precision nitrogen management of corn in fields with manure application and/or cover crops in Minnesota.

Azospirillum brasilense inoculation to enhance corn nitrogen uptake (Year 4)

Principal investigator: Paulo Pagliari, assistant professor and nutrient management specialist, UMN Extension

Overview: This project studies the ability of the bacterium Azospirillum brasilense to supply corn plants with nitrogen. The researchers will test Azospirillum brasilense strains isolated from Minnesota soils in corn plots supplied with nitrogen at five different rates. Minnesota Corn is providing two grants for the project—one for trials in Becker and another for the trials in Lamberton.

Manure vs commercial fertilizer vs 1/2 rate nitrogen/ manure corn plot (Year 5)

Principal investigator: Blair Hoseth, farmer, Mahnomen County

Overview: This project studies how the use of beef manure and/ or commercial fertilizer affects yield, profit, and soil health. In 2025, Hoseth will utilize one plot with manure, one plot with manure and commercial fertilizer, and a third plot with commercial fertilizer only.

Reducing nitrate in a surficial sand aquifer, Mower County MN (Year 6)

Principal investigator: Steve Lawler, Mower County SWCD

Overview: This project is studying how cover crops and split nitrogen application affect nitrate leaching. The researchers are conducting the study on a plot in Mower County within an area that has been identified as a sensitive groundwater area by the state.

Teaching the effect of stand on season-long metrics and yields (Ongoing)

Principal investigator: Adam Alford, Southwest Minnesota State University (SMSU)

Overview: This project provides an educational plot for SMSU students that explores how planting population impacts season long metrics of corn as well as yields. In planting and maintaining a plot in this manner, Alford aims to improve the undergraduate educational experience at SMSU and within the greater community.

A scene from the 2024 SMSU Agronomy Field Day.


MinnesotaCorn
Follow Minnesota Corn on social media:
MinnesotaCorn
MinnesotaCorn
@mncorn
@MNCornVids
mncorn.org