

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



Research findings are discussed at a field day in northwestern Minnesota at the farm of Vance Johnson.

Variable rate nitrogen application in corn fields applied with manure (Year 1)

Project lead: Peter Anthony, farmer Nicollet County

Overview: This project will study how precision nitrogen technology affects corn growth, yield, and other agronomic properties on fields that have cover crops and manure.

Weed suppressive cover crop incorporation in organic corn educational plot (Year 1)

Project lead: Allen Deutz, farmer, Lyon County

Overview: Deutz plans to work with educators and students at Southwest Minnesota State University (SMSU) to plant brassicas and legume cover crops into small organic corn plots during the last cultivation pass. The team will evaluate the effectiveness of the cover crop at suppressing weeds and, after harvest, whether the cover crop-corn stalk mix is more nutritious for cattle than corn stalks alone.

In-furrow compost extract use in corn (Year 1)

Project lead: Mark Enninga, farmer, Nobles County

Overview: This project is studying whether a compost extract applied in furrow on a strip-tilled farm in Nobles County improves soil nutrient cycling, plant growth, disease suppression, and boosts yield.

Testing the effectiveness of microbials and fertility management (Year 1)

Project lead: Jakob Hicks, farmer, Redwood County

Overview: This project is studying the effectiveness of three microbial products, Pivot Bio, Envita, and Source, at improving yields and soil health when various nitrogen rates are applied.

Purification of procyanidins for nitrous oxide reduction in corn fields (Year 1)

Project lead: Chejen Hsiao/Tim Griffis, UMN

Overview: Grape seed extracts contain the compound procyanidin, which reduces the conversion of nitrates to nitrous oxide, a greenhouse gas that contributes to global warming, but they can also contain compounds that counteract the effects of procyanidins. The researchers in this project will identify the chemical compositions of various extracts and attempt to remove compounds that counteract the effects of procyanidins.

Corn yield and soil nutrient availability after algae amendment application (Year 1)

Project lead: Paulo Pagliari, UMN

Overview: The project will assess the effectiveness of algae as a field corn fertilizer. The researchers will harvest the algae for this study from a lake with elevated nutrient levels in south-central Minnesota. They will also study whether harvesting the algae improves water quality. Researchers will work with high school students from St. Mary’s Catholic School in Sleepy Eye on the project.

Azospirillum brasilense inoculation to enhance corn nitrogen uptake (Year 2)

Project lead: Paulo Pagliari, UMN

Overview: This project continues research into the potential for the nitrogen-fixing bacterium *Azospirillum brasilense* to improve nitrogen use efficiency. In 2022, researchers found a 10% yield increase in inoculated plots vs. non-inoculated plots and to achieve that maximum yield in the non-inoculated plots, twice as much nitrogen was needed.

Variable rate sulfur application (Year 2)

Project lead: Kirk Stueve, farmer, Traverse County

Overview: Stueve is working to determine how soil and landscape factors affect corn’s response to sulfur fertilization application and develop variable-rate sulfur application strategies. He’ll use five different sulfur rates on three fields to determine his recommendations.

Evaluating sulfur and ESN with Pivot Bio (Year 3)

Project lead: Les Anderson, farmer, Goodhue County

Overview: Anderson will compare three treatments: Pivot Bio and 120 pounds of nitrogen per acre preplant; 160 pounds of nitrogen per acre side dressed; and 120 pounds of nitrogen per acre — one-third applied as the environmentally smart nitrogen enhanced efficiency product and two-thirds applied as urea.

Replicated manure vs. commercial fertilizer plot (Year 3)

Project lead: Blair Hoseth, farmer, Mahnomen County

Overview: Hoseth compared the two nutrient sources on a corn field in 2022 and found that commercial fertilizer was a slightly better choice from a cost perspective. This year, the project will compare how manure and commercial fertilizer affect yields and organic matter on a soybean field in northwestern Minnesota.

Continued on back cover

Wilkin SWCD soil health demonstration site (Year 3)

Project lead: Vance Johnson, farmer, Wilkin County

Overview: This project continues a study of how an extended five-year crop rotation in combination with different tillage systems and cover crops affects soil properties. Johnson and the Wilkin Soil & Water Conservation District will share the information during a field day.

Living carbon vs. commercial fertilizer (Year 3)

Project lead: Gary Prescher, farmer, Faribault County

Overview: This project is the third year of a study comparing a composted manure product and commercial fertilizer in corn and soybean fields. New this year, Prescher will plant strips with and without Pivot Bio.

Soil health and economics from long-term cover cropping (Year 3)

Project lead: Mikayla Tabert, farmer, Red Lake County

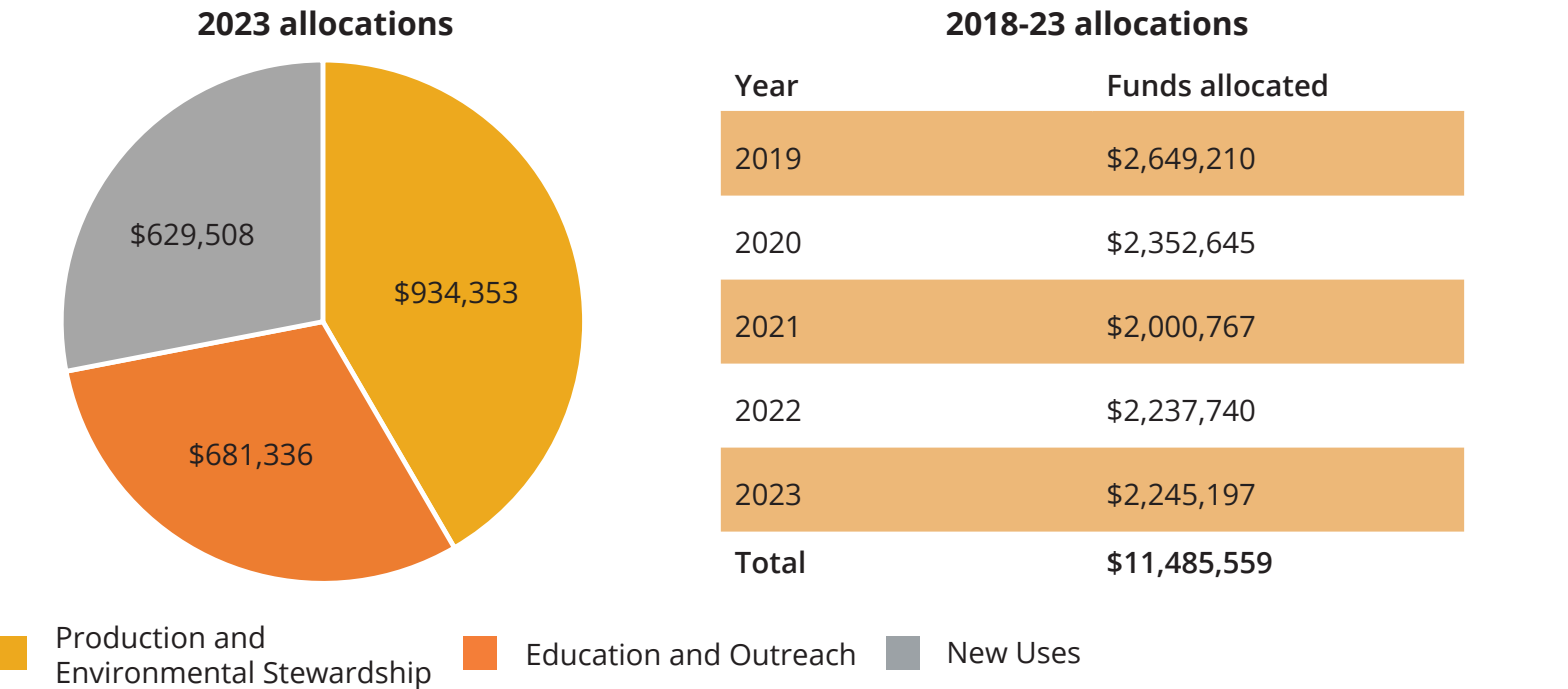
Overview: The project aims to demonstrate the economic and soil health benefits of integrating cover crops into a crop rotation. In 2023, Tabert and the team will plant corn and interseed cover crops at the V4 growth stage.

Reducing nitrate in a surficial sand aquifer, Mower County, MN (Year 4)

Project lead: 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.

Minnesota Corn research program



Listen to the Minnesota Corn Podcast!

Learn more about Minnesota Corn’s research projects with host Mark Dorenkamp, a reporter for Brownfield Ag News.

info.mncorn.org/podcast



Questions about Minnesota Corn’s research program? Contact Research Director Maciej Kazula, Ph.D., at mkazula@mncorn.org.

MinnesotaCorn
500 E Travelers Trail Suite 600 • Burnsville, MN 55337
P) 952.233.0333 F) 952.233.0420 W) mncorn.org



MinnesotaCorn

Driving innovation through research



Farmers invest in their future



Lab work at the University of Minnesota/ National Science Foundation Center for Sustainable Polymers

In March, Minnesota Corn announced its 2023 slate of research projects, which aim to increase the productivity, profitability, and sustainability of corn production. This year, Minnesota Corn allocated over \$2 million to 31 projects focused on corn-based plastics, ethanol fuel cells, precision irrigation, various nitrogen-fixing bacteria, and more.

“Research projects funded through the Minnesota corn check-off are helping build a brighter future for family corn farmers, rural communities, and all Minnesotans. Through its research program, Minnesota Corn invests in efforts to expand uses for corn while increasing the sustainability and productivity of corn farming. We appreciate the dedication of our researchers and look forward to seeing the results of their work.”

— John Mages, chair, Minnesota Corn Discovery & Development Team

Projects are located across the state and are led by both farmers and professional scientists, most of them from the University of Minnesota. They were selected by the Minnesota Corn Research & Promotion Council, based on the recommendations of Minnesota Corn's Discovery & Development Team. Team members evaluated projects based on their novelty, how well they addressed Minnesota Corn's research priorities, and the value they will provide to Minnesota corn farmers.

Over 70% of the funds are allocated to farmer education on and studies of production and environmental stewardship topics, including nutrient management, water quality, drainage systems, and soil health. About 30% of the funds are allocated to projects focused on expanded uses for corn.

Below is a summary of Minnesota Corn's 2023 research allocations. Throughout the year, read updates on the projects at mncorn.org.

Education and outreach

Nitrogen Smart (Ongoing)

Project lead: Brad Carlson, University of Minnesota (UMN)

Overview: This investment funds the university's Nitrogen Smart program, which over 1,000 Minnesota farmers have completed over the past eight years. Nitrogen Smart focuses on how nitrogen behaves in the environment and how this affects nitrogen fertilizer management and environmental concerns. The program is also available online for growers to complete at their convenience. Learn more at z.umn.edu/nitrogensmart.

Advanced Nitrogen Smart (Ongoing)

Project lead: Brad Carlson, UMN

Overview: This investment funds the university's ongoing Advanced Nitrogen Smart series, which provides education and information on maximizing economic return on nitrogen investments while minimizing nitrogen losses. Advanced Nitrogen Smart classes focus on the 4Rs of nitrogen application, adapting nitrogen management to climate, and manure management.

MAWRC-Discovery Farms Research and Education Program (Ongoing)

Project lead: Warren Formo, Minnesota Agricultural Water Resource Center (MAWRC)

Overview: This grant provides funding to MAWRC, a research and education organization dedicated to increasing awareness of water-related issues within the agricultural community. Learn more at discoveryfarmsmn.org.



Graduate student Daniel Krajovic of the Hillmyer Lab at the University of Minnesota

Enhancement of survey efforts for corn pests (Ongoing)

Project lead: Anthony Hanson, UMN

Overview: This investment allows the university to continue surveying for corn pests and diseases. Over the next year, researchers will quantify moth flight time for several insect pests, including black cutworm and European corn borer. They will also survey overwintering European corn borer larvae and develop a specialized survey to determine the risk from key corn diseases, such as stalk rot and tar spot. Ultimately, the effort leads to a long-term cooperative effort to predict and quantify changes in economic losses from corn pests.



University of Minnesota Extension Educator Brad Carlson leads a Nitrogen Smart seminar.

Minnesota. The educator helps corn growers stay up to date on the latest water quality and nutrient management research through publications, seminars, workshops, podcasts, videos, and more. The role is held by Brad Carlson.

Climate smart agriculture Extension program (Year 2)

Project lead: Heidi Roop, UMN

Overview: This investment funds University of Minnesota Extension's efforts to help corn growers and the agricultural sector manage climate and weather extremes that could impact their productivity and operations. Scientists will hold several engagement events and convene at least one “action planning” workshop to discuss and develop potential management strategies.

UMN Extension water quality education (Ongoing)

Project lead: Michael Schmitt, UMN

Overview: This investment funds a half-time water quality extension educator position at the University of

Expanded uses for corn

Direct ethanol fuel cells (Year 1)

Project lead: Alex Buck, Iowa Corn Growers Association

Overview: The project is developing a direct ethanol fuel cell, a device used to convert ethanol directly into electricity. The generated electricity can be used for various power generation needs, including personal generators, disaster relief, grid power, and electric vehicles.

Genetic and environmental factors contributing to instability in grain durability (Year 2)

Project lead: Candice Hirsch, UMN

Overview: This project is assessing the different factors that contribute to grain durability and composition, which are important factors in considering grain quality for export markets. The Minnesota Corn Research & Promotion Council and the National Corn Growers Association are co-funding the project.

Ethanol fuel cells (Year 2)

Project lead: Luca Zullo, Agricultural Utilization Research Institute (AURI)

Overview: This project is studying the feasibility of utilizing ethanol as the feedstock for hydrogen, a gas with a variety of industrial uses, including as a fuel cell for power generation. If successful, the project will allow AURI to build a coalition to seek funding for a commercial-scale project.

Sustainable polyesters from corn as tomorrow's advanced materials (Year 5)

Project lead: Marc Hillmyer, UMN/National Science Foundation Center for Sustainable Polymers

Overview: This project, which Minnesota Corn has funded since 2019, aims to develop new biobased plastics and improve existing materials. In 2023, researchers will continue focusing on improving the structure and performance of polylactic acid plastic, developing methods to generate corn-based polymers, exploring the usefulness of new biomolecules, and more.



Herbicide application on a southeastern Minnesota corn field.

Production and environmental stewardship



Students in Tim Griffis' laboratory at the University of Minnesota conduct lab work

Mitigating cold and warm season nitrogen losses from corn systems (Year 2)

Project lead: Tim Griffis, UMN

Overview: This project is studying whether enhanced efficiency fertilizers (EEFs) reduce reactive nitrogen losses during the soil freeze-thaw cycles of spring. The researchers are studying the effectiveness of these practices using indoor growing chambers known as mesocosms.

Is fixed ammonium an important part of the nitrogen cycle? (Year 2)

Project lead: Daniel Kaiser, UMN

Overview: This project will assess 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.

Nutrient management dynamics in northwestern Minnesota corn production (Year 2)

Project lead: Lindsay Pease, UMN

Overview: This project is studying how various sources and rates of phosphorus application in a northwestern Minnesota corn-soybean rotation affect yield, nutrient availability, and nutrient runoff. The findings will help improve the university's nutrient management recommendations for corn-soybean rotations in this region of the state.



University of Minnesota irrigation specialist Vasudha Sharma

Precision irrigation and nitrogen management for enhancing water/nitrogen-use efficiency (Year 2)

Project lead: Vasudha Sharma, UMN

Overview: This project is researching how variable rate irrigation and variable rate nitrogen affect nitrate leaching, corn plant growth and development, yield, and evapotranspiration as opposed to uniform methods in central Minnesota. Researchers hope to learn more about precision irrigation solutions, tools, and technologies that can help producers use water and nutrients more efficiently, thereby increasing on-farm profitability and reducing the environmental impact of irrigated agriculture.

Dialing in the most profitable and environmentally responsible nitrogen rate (Year 3)

Project lead: Fabian Fernandez, UMN

Overview: This project is studying how much nitrogen is lost to the environment when the nutrient is applied at different rates. It's also looking at yield, economic return, and nitrogen use efficiency. The study will generate a one-of-a-kind dataset to evaluate nitrogen rates where different production and environmental goal outcomes can be optimized.

Evaluating conservation practice effectiveness with a paired watershed approach (Year 5)

Project lead: Gary Feyereisen, USDA Agricultural Research Service

Overview: This project is studying how conservation practices implemented on multiple farms within a watershed impact nutrient losses. The end goal is to compare a south-central Minnesota watershed where enhanced conservation practices are implemented to an adjacent watershed where farmers continue as usual. Researchers will also continue evaluating a bioreactor that filters water from one of the watersheds.

Hyperstable enzyme to control plant diseases (Year 6)

Project lead: Mikael Elias, UMN

Overview: This project continues research into enzymes that degrade the small signaling molecules bacteria use to communicate when it's time to active genes that increase their capacity to cause disease. In 2022, the researchers found that the enzyme can reduce Goss' Wilt on a field scale. In 2023, the researchers will try to confirm whether the enzyme can reduce damage to crops and evaluate the compatibility of the enzyme with current market products.