

2024 Sustainability Report



MinnesotaCorn

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2024 SUSTAINABILITY REPORT

EXECUTIVE SUMMARY

Minnesota Corn has made significant investments for decades in three important elements of sustainability including people, planet, and profit.

People – Strengthen rural communities while enabling a safe and healthy quality of life for non-farmers and ensuring food security for communities worldwide. Minnesota Corn’s support in this area has manifested itself through sponsorships, academic scholarships, and support for activities at the local level through affiliated county corn organizations.

Planet – Responsibly managing and replenishing finite resources used for farming while protecting and enhancing the environment that is impacted by farming practices. Minnesota Corn has made substantial investments in research and extension programs focused on improving productivity as well as practices that benefit the environment.

Profit – Providing a fair profit margin for farmers while delivering equitably priced goods to the non-farming public. Minnesota Corn has supported key market development activities including: investments in export programs for corn, corn products, and animal protein; commercialization of new corn-based products; and ethanol promotion. Supporting a reliable and diverse market for corn farmers enables them to make investments both in the community and best management practices on their farms to benefit the environment.

Minnesota Corn’s approach to sustainability is a journey. This inaugural report details the investments to-date in projects and programs that comprise the three pillars of sustainability. This establishes a baseline for tracking progress in the years to come. Future versions of this report will build on this baseline and include an action plan and associated metrics to track Minnesota Corn’s continued progress in its sustainability journey.

Letter from Minnesota Corn Leadership

Dear friends of Minnesota Corn,

Thank you for reading Minnesota Corn's first sustainability report, which documents how our organizations are supporting rural communities, stewarding natural resources, and ensuring the prosperity of family corn growers. We know that, now more than ever, sustainability is top of mind for consumers and agricultural producers, and we aim to provide a comprehensive accounting of our progress in this sphere. Many of our sustainability efforts have been ongoing for years, or even decades, and we're excited to document them in the report. We appreciate your interest in our work and hope you find the report an engaging and insightful look at Minnesota Corn's sustainability efforts on behalf of growers.

Minnesota Corn's approach to sustainability encompasses three important elements, all of which relate to and influence each other.

- **People:** Strengthen rural communities while enabling a safe and healthy quality of life for non-farmers and ensuring food security for communities worldwide.
- **Planet:** Responsibly manage and replenish finite resources used for farming, while protecting and enhancing the environment that is impacted by farming practices.
- **Profit:** Provide a fair margin of profit for farmers, while delivering equitably priced goods to the non-farming public.

As you'll read, the report is divided into three sections. The first details Minnesota Corn's continued support of the state's rural communities, investments we believe are critical to any successful agricultural sustainability initiative. From supporting county corn grower associations to leadership initiatives, and supporting ag-focused organizations like 4-H and FFA, Minnesota Corn for years has played an important role in the success of farming communities. We're proud of these continued efforts and excited to detail them here.

Second, the report highlights the Minnesota Corn Research & Promotion Council's dozens of corn check-off investments in university-level, on-farm research and education programs. Since 2008, Minnesota Corn has provided more than \$19 million in support to these initiatives. The report also details Minnesota Corn Growers Association's grassroots advocacy for programs and policies that provide growers with the resources to implement science-based practices best for their respective operations. Additionally, it notes a new Minnesota Corn effort in partnership with an independent third party named Eocene Environmental Group to document the on-farm tillage, fertility, crop rotation, and conservation practices of grower-leaders.

Third, a farmer will not be sustainable without a fair profit margin. This section highlights the ways Minnesota Corn is building and maintaining demand for corn through its support of market development efforts and new uses projects. From investing in export development organizations such as the U.S. Grains Council to supporting efforts to increase the availability and usage of biofuel blends, Minnesota Corn is taking comprehensive steps to increase opportunities for growers. These efforts increase the sustainability of fuels and consumer products while ensuring long-term prosperity for growers.



Dana Allen-Tully
President, MCGA



Gary Prescher
Chair, MCR&PC

Once again, we thank you for your interest in our first Sustainability Report and your support of the state's corn farmers. We look forward to building on our existing sustainability efforts, including continued investments in best practices, on-farm research, and partnerships with public agencies, agricultural groups, and environmental groups. We look forward to working in partnership in the coming year to ensure prosperity for corn growers and all Minnesotans, and appreciate the efforts of all growers, community members, and Minnesota residents on this journey.

Sincerely,



Dana Allen-Tully
President
Minnesota Corn Growers Association (MCGA)



Gary Prescher
Chair
Minnesota Corn Research & Promotion Council
(MCR&PC)



With nearly 7,000 members, Minnesota Corn Growers Association (MCGA) is one of the largest grassroots farm organizations in the United States. MCGA works in close partnership with the Minnesota Corn Research & Promotion Council (MCR&PC) as Minnesota Corn and identifies and promotes opportunities for Minnesota's 24,000 corn farmers while building connections with the non-farming public. Minnesota Corn invests in third-party research that focuses on water quality and soil health, develops new uses for corn and works to add value to every bushel of corn grown in Minnesota. Minnesota corn farmers are continuously working to improve and become better stewards of our state's natural resources while maintaining a thriving rural economy. To learn more, visit mncorn.org.

INTRODUCTION

Minnesota Corn has been actively engaged in sustainability for many years with significant emphasis in three pillars of sustainability. This inaugural report summarizes these efforts over time, focused on the time frame from 2008 to 2023, and provides a foundation for a sustainability plan moving forward.

In this report, you will find valuable information that gives further insight into the three pillars of Minnesota Corn's sustainability efforts, and you will understand how those efforts are supported through investments in research, connecting farmers and non-farmers, and new uses.

In its simplest form sustainability can be defined as farming in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs. Minnesota Corn's approach to sustainability encompasses three important elements, all of which relate to and influence each other.

- **People:** Strengthen rural communities while enabling a safe and healthy quality of life for non-farmers and ensuring food security for communities worldwide.
- **Planet:** Responsibly manage and replenish finite resources used for farming, while protecting and enhancing the environment that is impacted by farming practices.
- **Profit:** Provide a fair margin of profit for farmers, while delivering equitably priced goods to the non-farming public.

This report not only gives examples of how Minnesota Corn's work supports the three pillars of sustainability, but includes graphs, images, descriptions, and helpful footnotes where you can find additional information. You can also visit mncorn.org for more details on topics included in the report.

PEOPLE

A key pillar of sustainability is strengthening rural communities while enabling a safe and healthy quality of life for farmers and non-farmers and ensuring food security for communities worldwide. Minnesota's growing conditions support corn's ability to provide a consistent, resilient, and reliable supply of food, feed, fuel, and biobased products. As an organization, Minnesota Corn's support for Minnesotans has manifested itself through sponsorships, academic scholarships, and support for activities at the local level through affiliated county corn organizations.

Sponsorships

Minnesota Corn sponsorships have focused on specific areas that help strengthen communities including engaging youth, developing agricultural leaders, promoting modern farming practices, and building connections with the non-farm public.

From 2021 to 2023, more than \$980,000 has been invested in youth through programs such as Twin Cities Road Crew, Minnesota Ag in the Classroom, FFA, and 4-H. Approximately \$275,500 has been spent on promotion and developing ag leaders through various partner programs. Finally, Minnesota Corn has invested more than \$223,000 into building connections with the non-farm public through organizations such as Farmamerica and the Minnesota Landscape Arboretum.



SPOTLIGHT | Minnesota Agriculture in the Classroom



Minnesota Agriculture in the Classroom (MAITC) provides free curriculum, educational resources, grants, outreach, and professional development opportunities to increase ag literacy through K-12 education. In 2022, Minnesota Corn helped MAITC reach over 161,000 K-12 and postsecondary students with messages about agriculture and farming. Minnesota Corn's support also helped MAITC operate its farm camp program.

Scholarships

Minnesota Corn awards scholarships to young adult members pursuing careers and degrees in agriculture as part of its mission to support the next generation of farmers and agricultural professionals. Minnesota Corn currently offers four \$5,000 scholarships to its Young Adult Members each year. Since 2019, Minnesota Corn has awarded 16 scholarships totaling \$80,000.

County activities/outreach

Supported in part by Minnesota Corn, county corn affiliates engage farmers and non-farming rural audiences through community gatherings, local programs, golf tournaments, fuel promotion events, scholarships, and more. The state's 52 county affiliates collectively engage thousands of consumers about biofuels and corn farming through more than 300 events and community activities each year. Minnesota Corn has invested more than \$1 million in county activities and events in the last three years.

SPOTLIGHT | Engaging Consumers



Grower-leaders from the Wright/Hennepin Corn & Soybean Growers Association participated in an Elementary Ag Day hosted by the Dassel-Cokato FFA chapter. The 700-plus students in attendance learned about the many uses of the corn plant, from food to consumer products.

PLANET

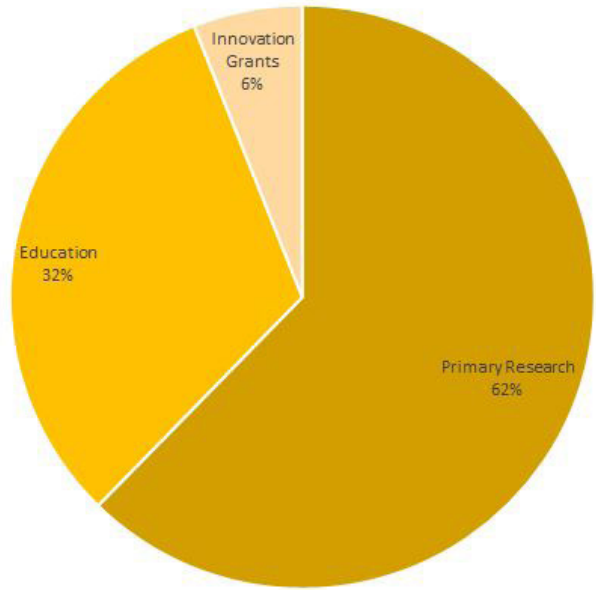
A key aspect of sustainability includes responsibly managing and replenishing finite resources used for farming, while protecting and enhancing the environment that is impacted by farming practices. Minnesota Corn has made substantial investments in research and extension programs focused on improving productivity as well as practices that benefit the environment.

Minnesota Corn has leveraged financial investments by also advocating for state and federal funding for research activities, as well as cost-share resources to aid corn farmers in implementing best management practices on their farms. These efforts are being documented by state and federal agencies as well as Minnesota Corn's own efforts to conduct on-farm sustainability assessments.

Minnesota Corn's approach to best management practices is guided by the following principles:

- **Science-based** – focus on adopting sustainability practices that are supported by accepted science
- **Economically-viable** – practices that are scientifically validated and that farmers can afford to implement
- **Measurable** – the practices and adoption will be measurable using accepted standards
- **Attainable** – the point of entry into adopting sustainable practices is seen as doable by farmers
- **Flexible** – farmers need the flexibility to test different practices and variables to see what works on their farm
- **Phased in over time** – adoption of new practices will take time to allow for experimentation, assessments and making the required investments
- **Need to discover more answers** – the development of best management practices is a continuum that evolves with the technology and the understanding of the underlying science. We currently don't have all the answers so there needs to be more research and testing to discover new viable practices.

Production Stewardship Research Investments 2008-2023



Above: Minnesota Corn Research & Promotion Council research and education investments between 2008 and 2023 totaled \$20 million. The chart shows distribution of those funds among three types of grants.

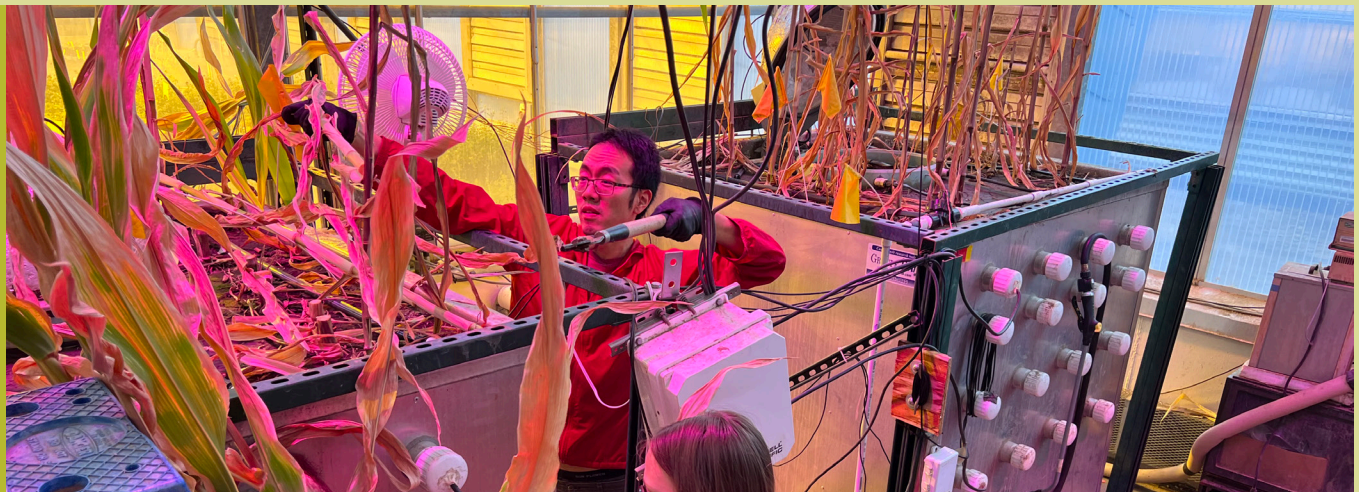
State of Minnesota Goals

Minnesota Corn recognizes the state's efforts to improve surface and groundwater as well as reduce greenhouse gas emissions (GHG). In 1990, Minnesota adopted the Minnesota Groundwater Protection Act (Minn. Stat. 103H.001) with the goal that the state's groundwater be maintained in its natural condition, free from any degradation caused by human activities where prevention is practicable. In accordance with the Groundwater Protection Act, the Minnesota Department of Agriculture developed a **Nitrogen Fertilizer Management Plan** (NFMP). Following a revision process from 2010 to 2014, an updated NFMP was adopted to better align with available programs and resources. The NFMP was the precursor to the Groundwater Protection Rule, which restricts fertilizer application on vulnerable soils and was finalized in 2019.

The Minnesota Pollution Control Agency developed the **Minnesota Nutrient Reduction Strategy**, which calls for reducing nutrient levels in major rivers by 10-20% by 2025 from 2014 levels with significantly higher reductions in 2040. Increased focus on nutrient management, specifically nitrogen, was elevated in 2023 due to a petition from environmental groups asking the EPA to intervene and regulate nitrates in southeast Minnesota groundwater through its emergency authority under the Safe Drinking Water Act. In November, EPA announced that further action is needed to protect drinking water in the region. The Minnesota state agencies of Health, Agriculture and Pollution Control have developed a workplan with short and long-term actions to address drinking water and nitrate concerns.

In 2007, Minnesota set economy wide GHG reduction goals in statute (Minn. Stat. 216H.02). In 2022, those goals were expanded in Minnesota's **Climate Action Framework**, which is working to reduce GHG emissions by 50% by 2030 and achieve net-zero emissions by 2050. In 2023, the Legislature updated the statutory GHG reduction goals to align with the Climate Action Framework. The goals discussed above simply scratch the surface detailing Minnesota's efforts to enact policy goals and implement programmatic efforts to address sustainability issues across economic sectors.

SPOTLIGHT | Mitigating cold and warm season nitrogen losses from corn systems



This project, led by Dr. Tim Griffis with the University of Minnesota, is studying whether winter rye cover crops and enhanced efficiency fertilizers reduce nitrous oxide losses during the soil freeze-thaw cycles of spring, which can contribute to 35% of the annual nitrous oxide emissions. The researchers are studying the effectiveness of these practices using indoor growing chambers known as mesocosms.

Research Best Management Practices

Minnesota Corn recognizes that we don't have all the answers in terms of practices that are both economically viable and beneficial to the environment thus our continued investment in research is critical. Every year Minnesota's corn farmers allocate approximately \$2 million to corn-based research projects. About two-third of these funds are used to develop or enhance multi-disciplinary research and extension/ education efforts to address key environmental challenges facing Minnesota corn producers across focus areas including but not limited to nutrient management, water and air quality, drainage systems, irrigation, soil health, and biological innovations. See Appendix A (page 20) for more information about Minnesota Corn's support of these types of programs.

Production and Environmental Stewardship – This program is geared towards land-grant institutions and focuses on topics related to corn production in Minnesota such as: soil fertility, nutrient management, water quality, drainage systems, agronomics, tillage and soil health, or genetics. Those projects are designed to bring an economic benefit to the state's corn farmers and improve their sustainability. From 2008 to 2023, more than \$12 million was spent on 66 individual Primary Research projects within the Production and Environmental Stewardship program.

Innovation Grants – In its eighth year, this program is designed to aid farmers to test or prove an innovative practice on their farm that promotes conservation, sustainability and profitability on the farm or solve a specific challenge. Originally focused on nutrient management, the program's focus has grown to accept proposals related to the following priorities that promote sustainability: improved nutrient use efficiency, comparative tillage innovations, economic and management innovations, and production practices that enhance water and air quality. More than \$1 million has been invested in 110 projects between 2016-2023.

Advocate for Research Investments – Advancing our knowledge of practices extends beyond the direct corn farmer investment but also requires public funding to further leverage resources and expand the reach. Minnesota Corn works closely with policymakers and partners to advocate for public funding when we see the potential in promising areas of research and education.

SPOTLIGHT | Sustainable Answer Acre (SAA) research project

When it comes to nitrogen, farmers want to know what keeps it in their fields so their crops can use it, and they want to know what will keep it out of the water that leaves the farm.

This project is a unique collaboration among public and private groups in south-central Minnesota where, on environmentally sensitive sandy ground four miles north of Austin, researchers and farmers are working together to find the solution to control the flow of nitrogen.

The project evaluates how split applications of nitrogen or using satellite imagery to set nitrogen rates compares to the more conventional technique of applying the full recommended amount of nitrogen onto the field before the emergence of the crop. Also on the site, other plots are proving the benefit of cover crops and reduced tillage as a means to enhance soil health.



In 2015, the Minnesota Corn Growers Association was a part of an agriculture coalition to enact a direct investment from the State of Minnesota in agricultural research at the University of Minnesota. The Agricultural Research, Education and Extension Technology Transfer program (AGREETT) was authorized in 2015 with approximately \$5 million per year to increase the capacity at the University of Minnesota to reach farmers across the state with research, data, and innovations that enable them to make sound decisions, conserve resources, cope with emerging problems, and discover new opportunities.

Since AGREETT was first authorized by the Minnesota Legislature, the University of Minnesota College of Food, Agricultural and Natural Resource Sciences (CFANS) has added 19 new faculty members including eight extension specialists in addition to five faculty in the College of Veterinary Medicine and 11 extension educators. This increased agricultural research capacity will continue to have a positive impact for agriculture well into the future.

In 2021 Minnesota Corn provided financial resources to the University of Minnesota to develop a **Climate Smart Agriculture Extension Program**. In 2023, MCGA supported public funding to expand this program into an Extension Weather Ready Program to increase the capacity of communities to prepare for and respond to changing climate extremes by providing needed education, research and technical assistance across Minnesota communities.

Advocate Best Management Practices

Building on the knowledge obtained through research, Minnesota Corn has worked with extension personnel, industry, policymakers, and more to move proven best management practices across multiple disciplines into mainstream adoption in corn production by supporting both education and cost-share programs. More than \$6 million has been invested in the development of educational programs between 2008 and 2023.

Educational/Extension programs – Support the development and distribution of educational material or programs that support sustainable, profitable production. Examples include Nitrogen Smart, Carbon Smart, the Soil Management Summit, and others.

SPOTLIGHT | Nitrogen Smart and Advanced Nitrogen Smart



Nitrogen Smart is an educational program, led by Brad Carlson with the University of Minnesota, for producers that presents fundamentals for maximizing economic return on nitrogen investments while minimizing nitrogen losses. It delivers high-quality, research-based education to more than 1,200 producers covering nearly 1 million acres of cropland. Topics covered at the Nitrogen Smart program include sources of nitrogen for crops, how nitrogen is lost from soil and how to reduce losses, managing nitrogen in drainage systems; and guides on split applications, alternative nitrogen fertilizers, soil and tissue testing and nitrogen models.

The program is also available online. Advanced Nitrogen Smart is available for those who complete the fundamentals course. The classes focus on the 4Rs of nitrogen application, adapting nitrogen management to climate, manure management, and preventing nitrate losses. Minnesota Corn has invested more than \$1 million in the Nitrogen Smart program since its inception.

Southwest Soil Health Project – This project will accelerate implementation of cover crops on corn acres in Central and Southwestern Minnesota by creating robust public-private partnerships and increasing farmers’ access to technical assistance. This project will strengthen the relationship and collaboration between agricultural retailers and Soil and Water Conservation Districts (SWCDs) by hiring agronomists in a model where management will be shared between these entities. The goal of the project is to implement 25,000 acres of cover crops in Central and Southwest Minnesota.

State and Federal cost-share funding – There is a long history of providing public support to farmers to implement conservation practices. Conservation programs were first included in the federal Farm Bill in 1935 and the conservation title of the bill has expanded over time. MCGA has been a consistent advocate for voluntary conservation practices based on the principle that each farmer is best equipped to determine what works best for their own operation. To help farmers implement practices and scale up best management practices, MCGA includes state and federal policy priorities each year focused on voluntary adoption of conservation practices.

At the federal level this has meant maintaining voluntary programs in the federal Farm Bill with additional cost-share and technical assistance resources and ensuring that new conservation compliance measures are not tied to safety net supports. At the state level MCGA has been a vocal supporter of making sure dedicated constitutional dollars, such as the Clean Water Fund, are directed towards on-the-ground implementation of practices instead of administrative staff at state and local government agencies.

SPOTLIGHT | MDA Soil Health Financial Assistance Grant Program

In 2021, MCGA led a coalition of agriculture groups and The Nature Conservancy to explore programming and policy on soil health that would be workable and achievable for Minnesota farmers. At the time, the groups were interested in elevating the soil health discussion beyond a single practice, such as cover crops, and



to develop a program with enough flexibility that an individual farmer could receive financial assistance for a practice that would work best on their farm. There was also an interest in developing a financing option that went beyond cost-share and addressed the real financial challenges in voluntary adoption of soil health practices.

Legislation was developed that would direct the Minnesota Department of Agriculture to implement a grant program for farmers to purchase equipment when implementing practices from a broad suite of options including reduced tillage, nutrient or manure management, cover cropping, precision agriculture, crop rotations, changes in grazing management and more. The Legislature authorized the program as a pilot program with \$500,000 in available funding. When MDA issued a request for proposals for the program, applications exceeded available funding by nearly 13 times demonstrating demand and interest in the program. In 2023, the Legislature approved nearly \$5 million in general and dedicated funds to expand the program. Interest remains high. In 2023 MDA awarded \$2.3 million in grants to 81 projects but received over \$8.4 million in requests from 284 applicants.

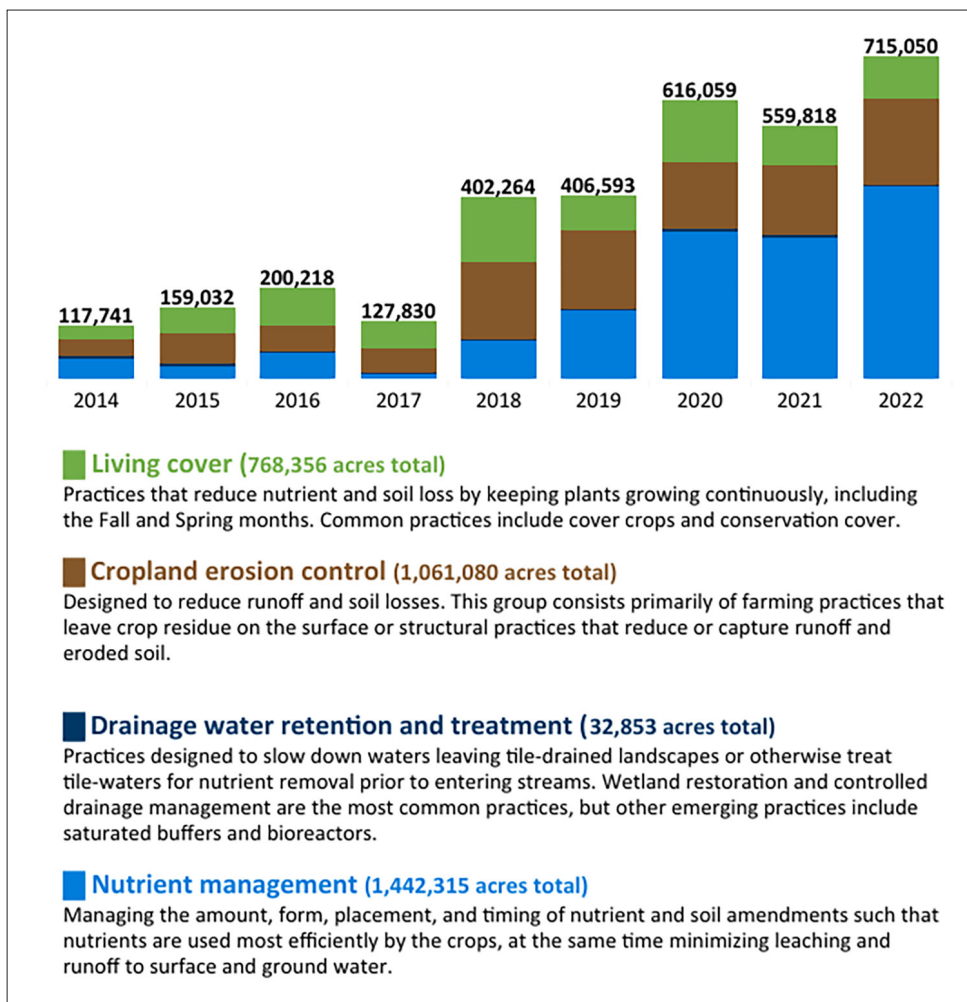
Specific projects MCGA has advocated for using Clean Water Funds include:

- **Ag Best Management Practices (AgBMP) loan program** to provide farmers with low interest financing for practice implementation
- **Conservation equipment assistance** for direct assistance to farmers to implement soil health practices
- **Ag weather station network** to give farmers the local information they need to make the best possible agronomic decisions regarding planting dates, crop protection timing, and more
- **Technical assistance program at the Minnesota Department of Agriculture** to support on-farm demonstration projects such as Discovery Farms
- **Conservation drainage management assistance** to assist drainage authorities to implement innovative drainage projects
- **Cover crop cost-share assistance** targeted on vulnerable soils
- **Minnesota Agricultural Water Quality Certification Program (MAWQCP)** at Minnesota Department of Agriculture to publicly recognize farms implementing voluntary conservation practices

Tracking Best Management Practices Implementation

Minnesota's corn farmers have adopted several Best Management Practices (BMPs) over multiple years through their own investments as well as leveraging state and federal cost-share programs. Documenting practice adoption illustrates Minnesota corn farmer's commitment to the environmental aspect of sustainability.

New Acres of BMPs – Minnesota's Clean Water Legacy Act requires that state agencies report actions taken in Minnesota's watersheds to meet water-quality goals and milestones (Minn. Stat. 114D.26, subd. 2). At right is a statewide summary of BMPs completed each year through state and federal cost-share assistance. Practices are organized by four categories including living cover, cropland erosion control, drainage water retention and treatment, and nutrient management.



New acres of Best Management Practices completed each year through state and federal government programs.

This summary assumes that a BMP installed in a given year will continue to operate within the reporting period. Some of the BMPs may not continue to be implemented once funding ends, thus the cumulative BMP acres reported represent an upper end estimate of cumulative practices.

Minnesota Agricultural Water Quality Certification Program – MAWQCP is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect Minnesota’s water. Those who implement and maintain approved farm management practices are certified and in turn obtain regulatory certainty for a period of ten years. Through this program, certified producers receive:

- **Regulatory certainty:** certified producers are deemed to be in compliance with any new water quality rules or laws during the period of certification
- **Recognition:** certified producers may use their status to promote their business as protective of water quality
- **Priority for technical assistance:** producers seeking certification can obtain specially designated technical and financial assistance to implement practices that promote water quality.

Through this program, the public receives assurance that certified producers are using conservation practices to protect Minnesota’s lakes, rivers and streams.

Since its inception, more than 1,400 farmers and 1 million acres have been Water Quality Certified in Minnesota.

On-Farm Sustainability Analysis – In 2023 Minnesota Corn’s directors committed to having on-farm assessments of soil health, water quality, economics, carbon sequestration and GHG emissions, and edge-of-field conservation practices using the Eocene Environmental Group *EcoPractices* approach. The inaugural assessment covered nearly 37,000 acres.

According to the USDA Census of Agriculture, cover crop usage increased 30% in Minnesota from 2017 to 2022.

Soil Health – NRCS defines soil health as the continued capacity to function as a vital living ecosystem that sustains plants, animals and humans. Soil health increases as the amount of soil disturbance and compaction decreases. In addition, having residue or a living cover outside of the growing season improves soil health by minimizing erosion. All of these practices stimulate biological activity which results in better nutrient cycling and grows healthy plants.

Water Quality – Minnesota is the land of 10,000 lakes where water quality is a core value held by Minnesota’s citizens. Corn farmers implement a number of in-field and edge-of-field practices to improve and protect water quality.

Carbon – Reducing carbon emissions and increasing carbon sequestration is influenced by weather, soil type, and management practices.

NOTE: See Appendix B (page 27) for diagrams and more details about the On-Farm Sustainability Analysis conducted by Eocene Environmental Group.

PROFIT

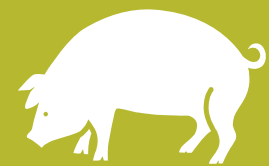
A key component of sustainability is providing a fair profit margin for farmers while delivering equitably priced goods to the non-farming public. Minnesota Corn is focused on maintaining and developing markets worldwide for corn and corn products. This has been accomplished through key market development activities including: investments in export programs for corn, corn products, and animal protein; commercialization of new corn-based products; and ethanol promotion. Supporting a reliable and diverse market for corn farmers enables them to make investments both in the community and best management practices on their farms to benefit the environment.

Technological advancements in agriculture such as seed genetics, crop protection products, drainage, and precision agriculture have increased productivity, which enables farmers to increase production using fewer inputs on the same amount of crop land. Maintaining access to these tools is critical in providing equitably priced goods and a fair profit margin for farmers while benefiting the environment. Minnesota Corn engages with federal partners through regulatory activities to advocate for the process to review and register crop protection tools, maintain approved tools, and support the development of new products that improve the efficacy of crop protection tools.

Exports

The benefits of profitability go beyond the farm gate and extend to the citizens of Minnesota. In 2020, crop production and related industries contributed \$8.7 billion in added value (sales minus cost of inputs), and 84,648 jobs in Minnesota. Minnesota's ethanol industry generated an additional \$6.6 billion of economic activity through sales in 2023 including \$1.3 billion of income for Minnesota residents. The industry supported 20,914 jobs and contributed \$2.5 billion to Minnesota's gross state product (GSP). (See Appendix C for source references.)

Exports of corn and co-products contribute to Minnesota's economy



Corn Exports

Ethanol Exports

Ethanol Coproducts

Corn Equivalent of Meat

14,917 jobs

\$1.24 billion GSP

\$3.8 billion output

\$1.78 billion total export value

1,963 jobs

\$149.6 million GSP

\$532.4 million output

\$215.1 million total export value

2,154 jobs

\$172.1 million GSP

\$612.4 million output

\$247.4 million total export value

2,645 jobs

\$219.4 million GSP

\$673.6 million output

\$315.9 million total export value

Value-Added Corn Products

Minnesota Corn has made significant investments in value-added corn products that benefit the state both economically and environmentally.

Biofuels – Minnesota is a leader in biofuels becoming the first state to require a 10% ethanol fuel blend standard in 2003 and maintaining the highest ethanol blend rate in the United States at 12.7% due to the significant number of retail locations offering ethanol blended fuels higher than 10%. Minnesota’s biofuel leadership can be partly attributed to investments by Minnesota Corn in biofuel research, promotion, and infrastructure totaling more than \$34 million since 2008. Ethanol adds \$1.20 in premium to the price per bushel of corn.

Not only has biofuels provided a market for corn farmers, but it has also helped clean the air by reducing carbon emissions. According to a 2023 study from the **Minnesota Bio-Fuels Association**, transitioning to a 15% ethanol blend statewide would result in an additional reduction of 1.027 million metric tons of CO₂ (carbon dioxide equivalent) over current 10% blends. This is the equivalent of removing nearly a quarter million passenger vehicles from Minnesota roads and highways.

***SPOTLIGHT** | ClearFlame Engine Technologies*

Nearly all semi-trucks on the road and tractors on the farm are powered by diesel engines. While proven to be reliable, diesel-powered engines are a notorious contributor to the emissions that harm our environment. A new technology is replacing diesel with ethanol to reduce the environmental costs while keeping these engines running as a vital part of our economy.

Based in Illinois, **ClearFlame Engine Technologies** keeps nearly all of the diesel engine characteristics intact while replacing only the components that allow it to switch to ethanol. For engine manufacturers, ClearFlame is a solution that allows them to meet increasingly stringent emissions regulations without sacrificing performance. The ClearFlame technology reduces fuel costs and GHG emissions. The estimated annual fuel cost savings for one truck running 100,000 miles is \$32,000.

A recent study conducted by **Gladstein, Neandross & Associates** found ClearFlame’s technology is expected to have the lowest total cost of ownership compared to diesel, natural gas, electric, and hydrogen platforms. Current tests show a 99% reduction in engine-out soot and a 42% lifecycle reduction in carbon emissions.

For the future of ethanol, carving out an increased role in heavy duty transportation would greatly increase demand. If only 20 percent of the heavy-duty transportation industry uses ClearFlame technology, it would double ethanol demand. Minnesota Corn partnered with ClearFlame to support and accelerate their efforts.



SPOTLIGHT | Minnesota Sustainable Aviation Fuel Hub



Sustainable Aviation Fuel (SAF) is a safe, fully certified jet fuel that can be used in today's aircraft engines and transported via existing pipeline infrastructure. Produced from many feedstocks including corn, SAF can significantly reduce lifecycle carbon emissions of aviation. Minnesota Corn has joined the Minnesota Sustainable Aviation Hub along with Greater MSP Foundation, Delta, Ecolab, Xcel Energy, Bank of America, and several other organizations in its mission to create a model for scalable SAF.

Green Chemistry – Minnesota Corn has also made significant investments in “green chemistry” that has the potential to both increase market demand for corn and associated co-products while also benefiting the environment. For example, since 2014, Minnesota Corn has invested more than \$3 million in the National Science Foundation Center for Sustainable Polymers (CSP) at the University of Minnesota and continues to work with companies founded by CSP researchers and based on CSP research to create a diversified market for corn farmers. These innovations create biobased products that are price-competitive with petroleum alternatives.

SPOTLIGHT | Låkril Technologies

Låkril Technologies, a University of Minnesota-based start-up, is supported in part by Minnesota Corn. It has developed a cost-effective method of producing acrylic acid and acrylates, chemicals widely used in the manufacturing of paints, coatings, textiles and more, out of renewable feedstocks like corn. Specifically, Låkril has developed a solid acid over which lactic acid — which is produced commercially from fermented corn sugar — converts into acrylic acid.



Currently, acrylic acid is derived from petroleum sources. Carbon dioxide emitted during the process of creating acrylic acid could be reduced by at least 35% by instead using a renewable feedstock, such as corn. Additionally, using a corn feedstock to produce acrylic acid could increase corn demand by tens of millions of bushels annually, providing a boost to Minnesota farmers and rural communities.

CONCLUSION

Minnesota Corn has made significant investments for decades in three important elements of sustainability including people, planet, and profit. Minnesota Corn's support for the community has manifested itself through sponsorships, academic scholarships, and support for activities at the local level through affiliated county corn organizations. Minnesota Corn has made substantial investments in research and extension programs focused on improving productivity with practices that also benefit the environment. Minnesota Corn has supported key market development activities including export programs, commercialization of new corn-based products, and ethanol promotion. Supporting a reliable and diverse market for corn farmers enables them to make investments both in the community and best management practices on their farms to benefit the environment.

This inaugural sustainability report details the investments in projects and programs that comprise the three pillars of sustainability for Minnesota Corn. This provides a baseline for tracking progress in the years to come. Future versions of this report will build on this baseline and include an action plan and associated metrics to communicate and track Minnesota Corn's sustainability journey. This will include tracking science-based best management practices supported by state and federal cost-share programs as well as practices implemented by corn farmers without cost-share support.

APPENDIX A – Minnesota Corn Research & Promotion Council Funded Research and Education Projects

The following pages contains a comprehensive list of research and education projects funded between 2003 to 2023. These projects and educational programs are related to water quality, soil fertility, best management practices and more.

Education and Outreach

Increasing access to grower education and outreach programs has been a focus for Minnesota Corn Growers Association and Minnesota Corn Research & Promotion Council since 2008. **Total investment 2008-2023: \$6,295,747.**

	Project Name	Time Frame	Affiliation
Water Quality	Minnesota Agricultural Water Resource Center & Discovery Farms	2008-2023	MAWRC
	Nitrogen And Advanced Nitrogen Smart Series; Nutrient Specialist Position	2010-2023	UMN
	Root River Field To Stream Partnership: Phases I & II	2014-2020	Root River SWCD and MDA
Best Management Practices	Enhancement Of Survey Efforts For Corn Pests In Minnesota	2017-2023	UMN
	Carbon Smart Programming	2021-2023	UMN
	Strategic Farming: Let's Talk Crops - Webinar Series	2021-2023	UMN
	Climate Smart Programming	2021-2023	UMN
Grower Education	Soil Management Conference	2017-2023	UMN
	15th International Conference On Precision Agriculture (ICPA)	2022	ICPA

Innovation Grants

In 2016, to increase grassroots involvement in the research process, Minnesota Corn began offering Innovation Grants. Innovation Grant projects must be in one of five categories within best management practices: new uses, methods to improve nutrient use efficiency in corn production, comparative tillage innovations, economic and management innovations, or production practices that enhance water and air quality or improve biodiversity. **Total awards funded 2016-2023: \$1,203,102**

Year	Grants Distributed
2016	10 Individual Projects
2017	20 Individual Projects
2018	14 Individual Projects
2019	12 Individual Projects
2020	10 Individual Projects
2021	19 Individual Projects
2022	11 Individual Projects
2023	14 Individual Projects

Primary Research

To receive funding, projects must focus on production stewardship or new uses for corn, ethanol, and ethanol co-products, such as dried distillers grains with solubles. Projects often stretch for multiple years, though researchers must reapply for funding each year for a given project. Minnesota Corn's Discovery & Development Team evaluates proposals. The team includes members of the Minnesota Corn Research & Promotion Council and Minnesota Corn Growers Association Board of Directors. **Total funds awarded 2008-2023: \$12,404,587**

	Project Name	Time Frame	Affiliation
Agronomy & Plant Genetics	On-Farm Evaluation Of Four Tillage Systems In A Corn-Soybean Rotation	2010-2015	UMN
	On-Farm Evaluation And Demonstration Plot Of Cover Crops Following Corn Silage	2013-2015	UMN
	Maximizing Soil Warming And Health Under Different Tillage Practices In A Corn-Soybean Rotation	2014-2019	UMN
	Hyper-Thermostable Enzyme (Lactonases) For Use As Microbial Biocontrol Agents For Plant Diseases	2017-2023	UMN
	Historical Assessment Of Improvement In Management Practices Associated With Corn Production	2018C26	UMN
	Soil Health Partnership	2018-2021	NCGA
	Phenomics Tools For Corn Breeding And Management Decisions	2019-2022	UMN
Air Quality	Reducing Reactive Nitrogen Losses From Corn	2019-2022	UMN
	Mitigating Cold And Warm Season Nitrogen Losses From Corn Systems	2022-2023	UMN
Corn Utilization	Optimization Of Denitrifying Bioreactor Performance With Agricultural Residue-Based Filter Media	2011-2012	USDA-ARS; AURI
	Converting Condensed Distillers Solubles (Cds) To Slow Release Fertilizers And Adsorbents For Phosphorus	2014-2015	UMN

	Project Name	Time Frame	Affiliation
Erosion Research	Evaluation Of Erosion Research	2009	UMN
	Quantifying The Impact Of Stream Alteration And Accelerated Streambank Erosion On Sediment And Phosphorous Load To The Mn River	2010-2012	University of North Dakota
	Role Of Depressions And Wetlands On Water Retention And Surface Flows In Blue Earth County, Minnesota	2011-2016	UMN
	Identification Of Erosion Mechanisms And Volume Loss For River Banks And Ravines	2012-2016	UMN
	Corn Response To Nitrogen And Starter Fertilizer Using A Modified Strip Trial Design	2012-2016	UMN
	The Role Of Structural Modifications Along The Mississippi River On Sediment Transport To Lake Pepin	2014-2016	UMN
Green Ammonia	Cost Of Production Of Nitrogen Fertilizer Produced From Wind Energy	2008-2010	UMN
	Ammonia Production From Electricity, Water And Nitrogen	2009-2012	American Algae, LLC
	Development And Evaluation Of A Novel, Small Pilot-Scale Non-Thermal Plasma Process For The Production Of Nitrogen Fertilizer From Wind And Other Renewable Resources	2011-2014	UMN
	Economic Evaluation Of Deploying Small-To Moderate- Scale Ammonia Production Plants In Minnesota Using Wind And Grid-Based Electrical Energy Sources	2011-2014	UMN
Nutrient Efficiency	Efficient Use Of Nutrients Applied As Starter Fertilizer	2008-2010	UMN
	Nitrogen Management For Success In The Strip-Till System	2008-2011	UMN
	Fertilizer And Manure Management Effects On Phosphorus In Corn And Soybean Production	2008-2009	UMN
	Algae Feasibility Demonstration	2009-2011	UMN
	Maximizing On-Farm Nitrogen And Carbon Credits From Alfalfa To Corn	2009-2012	UMN

	Project Name	Time Frame	Affiliation
Nutrient Efficiency	Tillage, Residue, And Nitrogen Management In High-Yield Continuous Corn For Grain, Ethanol, And Soil Carbon	2010-2014	UMN
	Corn Response To Starter Fertilizer As Affected By Planting Date And Maturity	2010-2013	UMN
	Split Application Of Sulfur And Potassium And Their Leaching Potential In Corn Grown Under Irrigation	2011-2013	UMN
	Predicting On-Farm Nitrogen Credits From Alfalfa To Second-Year Corn	2011-2014	UMN
	Nutrient Management Specialist For Agronomic Cropping Systems	2012-2018	UMN
	On-Farm Evaluation Of Tillage Systems And Nitrogen Management	2012-2014	UMN
	Carbon, Nitrogen, Phosphorus, And Sulfur Interactions Effects On Soil Biochemical Processes And Corn Grain Yield	2012-2015	UMN
	Nitrogen Fertilizer Management For Rain-Fed Corn In Mn If Spring Application Is The Only Option	2013-2016	UMN
	Paying Attention To The Details: Corn Nitrogen Recommendations In Uncertain Times	2013-2015	UMN
	Mineralization Potential Of Agricultural Soil And Canopy Sensing Technologies To Predict Corn Nitrogen Needs After Fertilization In Minnesota	2014-2016	UMN
	Best Management Practices To Integrate Cover Crops And Manure	2019-2023	UMN
	Assessment Of Minnesota's Soil Mineralogy And Impacts On Fertilizer Guidelines	2019-2022	UMN
	Nutrient Management Dynamics In Northwest Minnesota Corn Production	2022-2023	UMN
Is Fixed Ammonium An Important Part Of Nitrogen Cycling	2022-2023	UMN	
Water Quality	Evaluation Of The Slow Release Nitrogen Fertilizer For Irrigated Corn Grown On Coarse Textured Soils	2008	UMN

Continued on next page

	Project Name	Time Frame	Affiliation
Water Quality	Discovery Core Farms: Evaluation Of Drainage And Surface Water Quality Impacts Of Four Diverse Crop And Livestock Production Systems	2010-2012	UMN
	Sediment Fingerprinting For Sources And Transport Pathways In The Root River, Southeastern Minnesota	2010-2013	UMN
	Integrated Water Management Systems To Achieve Optimum Corn Production	2010-2013	UMN
	Testing The Origin Of Agricultural N Sources	2013-2015	UMN
	Evaluation Of New Management Practices For Increasing Corn Production And Reducing Environmental Risks Following Fall Anhydrous Ammonia Application	2011-2013	USDA-ARS
	Matching Conservation Drainage Practices With Nitrogen Application Rates And Sources For Minnesota	2011-2013	UMN
	Balancing Production Gains Against Environmental Impacts Of Nitrogen Fertilizer Management Practices	2012-2016	USDA-ARS
	Effects Of Time Of N Application And Instinct On Corn Production And Nitrate Losses From Tile Drainage	2013-2016	UMN
	Cropland Runoff Management Using Riparian Tailored Design Treatment Systems	2013-2015	UMN
	Farmable Vegetative Buffers	2013-2020	USDA-ARS
	Agricultural Production And The Hydrologic Cycle In The Upper Midwest	2013-2015	UMN
	Partitioning Of Phosphorus Sources In The Mn River Basin	2013-2014	UMN
	Tracking Conservation Success	2013-2015	Houston Engineering Inc.
	Quantifying Hydrologic Impacts Of Drainage Under Corn Production Systems In The Upper Midwest	2014-2018	UMN

Continued on next page

	Project Name	Time Frame	Affiliation
Water Quality	Enhancement Of Research Capacity On Excess Water Drainage To Improve Fertilizer Nitrogen Use Efficiency For Corn Production And Environmental Protection	2014-2016	UMN
	How Is Climate Change In Minnesota Affecting The Sustainability Of Corn Production?	2014-2016	UMN
	Optimizing Nitrogen Use Efficiency And Minimizing Nitrification-Induced N Leaching And Gaseous Losses With Post-Plant Fertilizer Applications: Field And Lab Studies	2014-2016	USDA-ARS
	Climate Change Impacts On Minnesota Corn Production And Environmental Consequences	2016-2018	UMN
	Impact Of Cover Crop Strategies On Productivity Of Corn	2016-2019	UMN
	Vegetative Cover Crops As A Nitrate Reduction Strategy For Tile Drainage	2016-2021	UMN
	A Decision Tree Approach To Identifying Buffer Alternative Management Practices	2017	UMN
	Irrigation Management Impacts on Corn Yield And Nitrate Leaching	2019-2022	UMN
	Evaluating Conservation Practice Effectiveness With A Paired Watershed Approach	2022-2023	USDA-ARS
	Dialing In The Most Corn-Profitable And Environmentally Responsible Nitrogen Rate	2021-2023	UMN
	Precision Irrigation And Nitrogen Management For Enhancing Water-Nitrogen Use Efficiency	2022-2023	UMN

APPENDIX B – Sustainability Analysis: 2022 On-Farm Practices Report

The following is a summary of on-farm assessments of soil health, water quality, economics, carbon sequestration & GHG emissions, and edge-of-field conservation practices using the Eocene Environmental Group *EcoPractices* approach. The inaugural assessment covered nearly 37,000 acres.

SUSTAINABILITY ANALYSIS

2022 ON-FARM PRACTICES REPORT

PROGRAM OVERVIEW

About Minnesota Corn

Minnesota Corn is one of the largest grassroots farm organizations in the United States. Minnesota Corn strives to identify and promote opportunities for Minnesota's corn growers while enhancing quality of life. This is accomplished by:



- › Promoting Sustainability Programs
- › Supporting Innovation
- › Advocating Best Practices
- › Fostering New Uses
- › Strengthening Partnerships

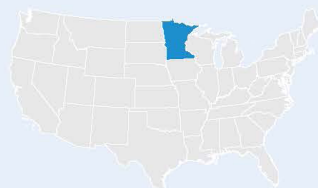
Verified by Sustainable Environmental Consultants' EcoPractices® Platform

Sustainable Environmental Consultants, LLC is an independent third party which provides scientific, evidence-based sustainability metrics for regenerative agriculture practices such as reduced tillage, improved soil health practices and increased carbon sequestration. Sustainable Environmental Consultants utilizes its proprietary EcoPractices platform to pinpoint the influence of these practices to provide actionable sustainability data.

With a growing demand by consumers and food companies for evidence-supported sustainability, this data can be used to increase product marketability, enhance industry communications and provide valuable insight for future in-field decisions.

CURRENT PROGRAM

The current program allows Minnesota Corn to view the impact of agricultural practices on **36,979 acres** from **485 fields**.



SUSTAINABILITY ANALYSIS

2022 ON-FARM PRACTICES REPORT

MINNESOTA CORN | EXECUTIVE SUMMARY

Soil Health

NRCS defines soil health as the continued capacity to function as a vital living ecosystem that sustains plants, animals and humans.¹ Soil health increases as the amount of soil disturbance and compaction decreases. In addition, having residue or a living cover outside of the growing season improves soil health by minimizing erosion. All of these practices stimulate biological activity which results in better nutrient cycling and grows healthy plants.

SOIL CONDITIONING INDEX (SCI)

Soil Conditioning Index (SCI) is a tool from NRCS that shows the trajectory of soil health. A positive SCI means a positive trajectory of soil health and vice versa.

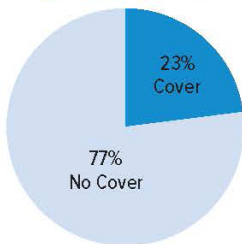
The fields in the project have an overall **positive (+) trajectory** based on the SCI.

SOIL TESTING

57% of fields had **updated soil tests**.



COVER CROPS BY % OF ACRES

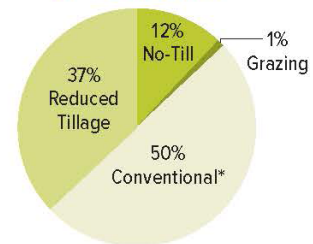


Cover crop varieties include **cereal rye, grass hay, mustard, oats, pea, pearl millet, rapeseed, triticale and winter wheat**.

According to the 2017 US Ag Census, the national average is **4% cover crop adoption, 37% no-till adoption, and 35% reduced till adoption**.

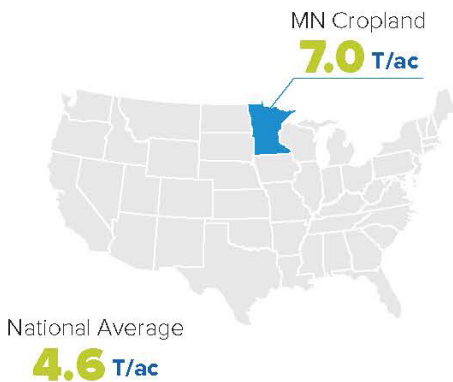
*Conventional tillage is defined as 70% or more residue incorporated and/or three or more passes of a tillage implement(s) in a given growing season.

TILLAGE BY % OF ACRES



EROSION AVERAGE (USDA)

The USDA National Resources Inventory provides estimates on average erosion for different systems across the US.*



IN-FIELD ENVIRONMENTAL OUTCOMES

The data is reflective of weather and soils influence in addition to implemented in-field management practices for the project year.[†]

OVERALL FARM Soil Erosion Rate 0.67 T/ac

IN-FIELD PRACTICES COMPARISON IMPACTS

When compared to conventional practices (i.e. conventional tillage, no cover crop scenario), in-field farm practices generated:[†]

19,293 tons of soil saved instead of being lost to erosion, which is the same as **1,206 dump trucks of soil**

SUSTAINABILITY ANALYSIS

2022 ON-FARM PRACTICES REPORT

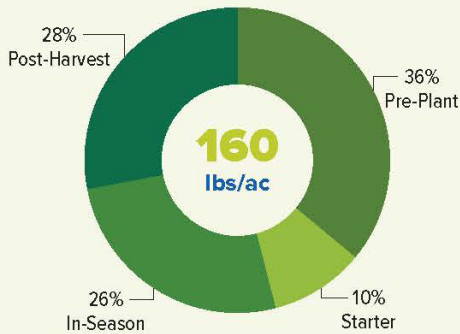
MINNESOTA CORN | EXECUTIVE SUMMARY

Water

Water in agriculture is evaluated both on quality and quantity. Water quality is affected by decreasing or eliminating contamination. For example, ensuring there isn't overapplication of nutrients decreases water quality risks. Water quantity is important in dry climates.

CORN NITROGEN TIMING & RATE

Split applying nitrogen can improve productivity and profitability and can reduce losses to the environment. This chart represents the percent of total nitrogen applied at different points in the growing season.



NITROGEN INHIBITOR/STABILIZER

51% of N applied corn acres utilized a N inhibitor or stabilizer.

Conservation Practice	Acres
Buffer	2,209
Forest	193
Grassed Waterway	173
Pollinator Habitat	15
Wetland	1

WATER QUALITY SAVINGS

When compared to conventional practices (i.e. conventional tillage, no cover crop scenario), in-field farm practices generated:[†]

- 62 tons of nitrogen saved** instead of being lost through leaching and runoff
- 8 tons of phosphorus saved** instead of being lost through runoff

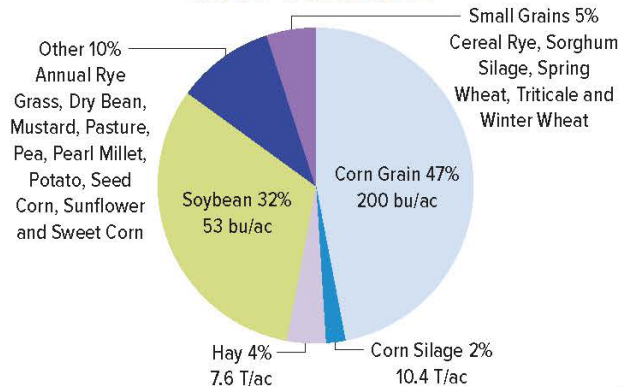
Economics

Farms maximize profit in two ways: increasing outputs or decreasing inputs. Increasing yield is often a key area of focus for farmers. While less popular, decreasing fertilizer, chemicals, water and other inputs can also be an effective way for farms to improve profitability.

CROP ROTATION

In North America, crop management is prone to monocropping systems, where the same species may be utilized in a field for repeated seasons. If this occurs the soil is subject to degradation due to non-varying root systems, and can impact crop growth and potential yield. To reduce the impacts on the soil and crop, growers are encouraged to increase their crop rotation. Acres under crop rotation also increase biodiversity, manage risk of on-farm economics, and vary input use.²

CROP DIVERSITY



SUSTAINABILITY ANALYSIS

2022 ON-FARM PRACTICES REPORT

MINNESOTA CORN | EXECUTIVE SUMMARY

Carbon

Reducing carbon emissions and increasing carbon sequestration is the goal of the metrics below.



WEATHER



SOILS



MANAGEMENT

Weather, Soils and In-Field Management Practices

influence the following environmental metrics

IN-FIELD ENVIRONMENTAL OUTCOMES

This data reflects the influence of weather, soils and implemented in-field management practices for the project year.[†]

	OVERALL FARM
Net GHG Emissions	0.01 T CO₂e/ac
Soil Carbon Sequestered	0.16 T C/ac

MANURE SAVINGS

Manure applied to fields provides organic matter, which positively impacts carbon sequestration. Manure was applied on **18% of acres**. The acres that received a manure application had an average of **155 lbs/ac of nitrogen** applied from the organic manure source. This is an estimated **cost savings of \$770,996** due to the reduction of synthetic fertilizers.



CROPLAND

93%

MIXED FORAGE

3%

4%

IN-FIELD PRACTICES COMPARISON IMPACTS

When compared to conventional practices (i.e. conventional tillage, no cover crop scenario), in-field farm practices generated:[†]



16,296 fewer tons of CO₂e, which is the same as



3,164 average passenger cars off the road for a year



4,336 tons of soil carbon sequestered



Powered by **ECO**PRACTICES

[†]Sustainable Environmental Consultants, through its EcoPractices platform, estimates an environmental impact value for reducing greenhouse gas emissions, reducing soil erosion, and reducing nutrient loss due to reduced leaching. These estimates adhere to processes that are documented by the NRCS Technical Guides and publications from the EPA. These values are tailored to a specific location and participant's operation. Models used are supported by USDA, NRCS, other government agencies, and major universities. Modeled results include input data from public resources for weather, soils, and historical crop rotation. Greenhouse gas simulations were produced from the Greenhouse Gas Inventory (GGIT) tool developed by Soil Metrics, LLC (2021) <https://soilmetrics.eco>. The GGIT tool implements the USDA-sanctioned greenhouse gas inventory methods described in Eve et al. (2014) 'Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory'. The GGIT tool utilizes greenhouse gas modeling technology developed for the COMET-Farm tool, licensed by Colorado State University to Soil Metrics, LLC.

¹USDA, NRCS 2021 Soil Health | ²USDA, NRCS CPS 328 | ³USDA, NRCS 2017 National Resource Inventory

This summary must not be edited or altered in any way without the involvement and consent of Sustainable Environmental Consultants, LLC

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