PROFITS THROUGH CONSERVATION: RESULTS FROM 2022 RETURN ON INVESTMENT STUDY

HEADWATERS AGRICULTURE SUSTAINABILITY PARTNERSHIP

PROJECT OVERVIEW

Purpose

The mission of the Headwaters Agriculture Sustainability Partnership (HASP) is to engage in projects that benefit the environment, the economic viability of farmers, and the vitality of rural communities. The purpose of this project is to build upon HASP's mission by exploring the return on investment from conservation practices implemented in dairy operations within the Sauk River Watershed.

Report Layout

- Executive Summary
- New participating farms are highlighted on a storyboard which includes:
  - Farm background.
  - Conservation practices and implementation.
  - Conservation practices impact.
  - Future plans.
- What's new on the farm? Updates from:
  - Mergen Acres
  - Mill Creek Dairy
  - Kerfeld Hill-View Farm
- Methodology
- Reading the results
- Aggregated results
- Summary of results and trends
- For more information
- Appendix: Conservation Practice list
- Acknowledgments

Goals

- Connect environmental outcomes from conservation to farm profitability.
- Promote peer-to-peer sharing among farmers around effective conservation for the environment and farm profitability.
- Connect these stories to broader communities and audiences interested in conservation.

Future

Our partnership's long-term hope is to develop a broad understanding of how and when conservation is providing improved environmental outcomes while maintaining or improving farm profitability in central Minnesota. Additional farms will be incorporated into this return-on-investment project through the Edge Dairy Cooperative's USDA Partnerships for Climate Smart Commodities grant.

EXECUTIVE SUMMARY

Recent federal investments in climate-smart agriculture systems and innovation are beginning to change the farm landscape in Minnesota. The Headwaters Agriculture Sustainability Partnership (HASP) has been at the forefront of this work for more than five years.

The partnership is laser-focused on finding solutions that benefit the environment, economic viability of farmers, and vitality of rural communities. On average, the farms participating in the HASP return-on-investment study demonstrated improved environmental and financial performance compared to regional benchmarks specific to their crop enterprises, proving profitability and environmental stewardship can be complementary.

Conservation practices helped reduce soil and nutrient runoff during the particularly wet spring of 2022 and retain moisture in the soil throughout the extreme drought conditions in the summer and fall of 2022.

Some participating farmers were more impacted by the drought and had poorer results compared to benchmarks, highlighting that there may be short-term risks when adding conservation practices to an operation because the benefits aren't yet established. As the project continues to expand, the data will better reflect long-term impacts of these practices.

Highlights from this year's data include:

- The acres enrolled increased significantly year-over-year by 128%. Nearly 4,000 acres are now being assessed in this study.
- Feed crops demonstrated higher net return over benchmarks - alfalfa at 105% and corn silage at 216%.
- The water quality improved near participating alfalfa and corn grain fields with a greater than 40% improvement over benchmarks for reducing soil erosion.
- Soil carbon was 17% better for alfalfa and 60% better for corn grain compared to benchmarks.
- Farmers on the 10 participating Minnesota farms use a variety of conservation practices including cover crops, buffer strips, no or low tilling, energy efficient lighting, grass waterways, and nutrient and manure management.

EXECUTIVE SUMMARY

This report marks four years of collecting data on the relationship between conservation practices, profitability, and farm productivity. Beginning with three farms in 2019, we now aggregate data from 10 farms enrolled in the return-on-investment study. The study growth and data history will allow us to report on emerging patterns in our next annual report and inspire confidence for farmers interested in adopting conservation practices.

In 2023, Environmental Initiative, which administers the Headwaters Agriculture Sustainability Partnership, was awarded funding through Edge Dairy Cooperative's USDA Partnerships for Climate Smart Commodities grant. The aim of the multi-year investment is to demonstrate that dairy farmers can produce a profitable and climate-smart commodity. In the coming year, the geographic scope of the return-on-investment study will expand while emerging and underserved farmers will be invited to participate.

We thank our funders for supporting this longitudinal study and report: AgCountry Farm Credit Services, Compeer Financial, Edge Dairy, Houston Engineering, Midwest Dairy, Minnesota Department of Agriculture, The Nature Conservancy, SLP, LLC, Syngenta, and USDA Natural Resource Conservation Services.

JER-LINDY FARM

Conservation story

Although they've been farming since 1979, it was not until 2002 that Jerry and Linda Jennissen could purchase the land for their farm. They now have 200 cows and farm alfalfa and corn sileage on 250 acres.

When the Jennissens bought the farm, the first thing Jerry did was work with agency partners to build a whole farm conservation plan to keep the farm financially, environmentally, and socially sustainable.

With funding from outside partners, Jerry and Linda have implemented conservation practices which have significantly improved their soil, even in places that previously had poor soil quality.

Jerry and Linda are motivated by their daughter, Alise, as she builds out her cheesemaking practice through Redhead Creamery. The family shares a dream that Jer-Lindy Farm can sustainably support Redhead Creamery production growth.

Practice Impacts

Grassed buffer strips

One of the first things Jerry and Linda did when they bought their farm was install a grassed buffer strip along the western portion of their land with funding from the Stearns Soil and Water Conservation District. They harvest the grass every year and appreciate how nice the restoration looks in addition to the value it adds to the farm.

Manure management: Stacking slab and lagoon

The Jennissens recently installed a manure stacking slab with funding through the Environmental Quality Incentives Program (EQIP). Production has improved organic matter, and the slab prevents runoff and water pollution. The lagoon into which the manure stacking slab drains helps prevent water pollution and was also an EQIP project.

Energy efficient lighting

The Jer-Lindy Farm received EQIP funding to install high-efficiency boilers and LED lighting in their milking barn. This upgrade has resulted in significant financial savings.

Grid testing

Grid testing the soil with the assistance of a crop consultant allows the Jennissens to monitor nutrients and soil needs. Areas of poor soil on the farm are now improving as a result.

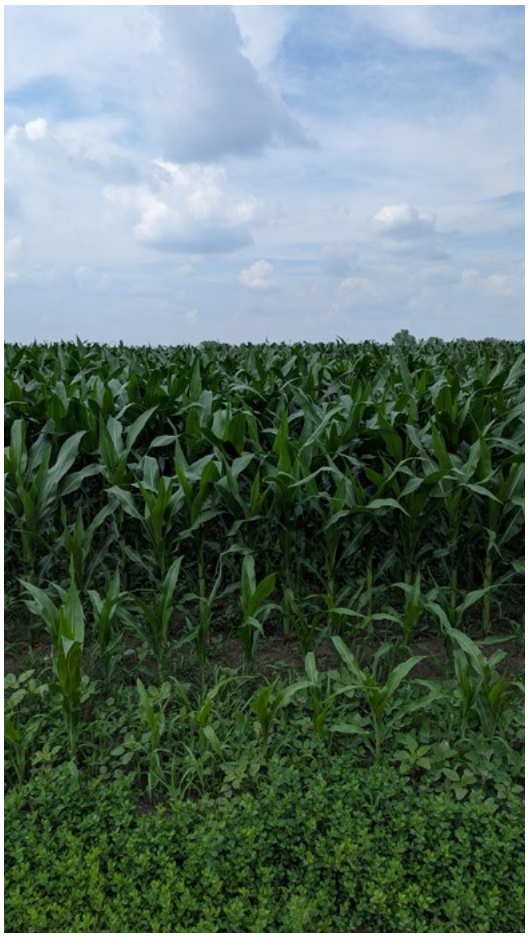
Moving into the Future

The Jer-Lindy Farm is undergoing an expansion. A robotic milking system shifts labor and increases the efficiency of their creamery, allowing staff to focus more time on valueadded agriculture endeavors. Additionally, they are building a kitchen, distillery, and tasting room that can seat almost 100 people. The expansion is necessary to create a business that will sustain lifelong employees, not just hourly workers. The Jennissens secured a rural development loan through USDA to finance the work.

"Conservation fits all three legs of sustainability. First, it's profitable. It's also socially acceptable and environmentally responsible. I wanted to make the land better, and I think most farmers do."

Main Takeaways

Jer-Lindy Farm has embraced the financial and technical support of funding and conservation partners to build their farm and improve their soil quality. While not every project has been a success, each of the partners involved put forth their best effort, and Jerry recommends any farmer interested in conservation reach out to them.



SCHEFERS BROS. DAIRY

Conservation story

Brothers Kenneth and Ralph Schefers took over operation of their 340-acre dairy farm from their father. They now operate it with Kenneth's wife, Julie, and son, Jason.

Kenneth and Ralph's father bought their land, complete with its rolling hills, in 1943. They always thought about implementing practices to reduce soil erosion, so the brothers brought that mentality into their work, adding in practices such as minimum tillage and a diverse crop rotation to preserve and improve the soil while reducing their need for additional chemicals.

They joined the return-on-investment program in part to see how their practices were doing against traditional practices. The Schefers were amazed to see the positive difference they had in profitability.

Kenneth knows that it can be a big leap to put these practices into farms and encourages interested farmers to attend field days, talk to their local soil and water conservation district representatives, and not to feel like they are alone in this.

"The lesson learned is that you need to be courageous to go out and try new things. There are just so many good results that you don't even see."

Practice Impacts

Crop rotation

The five-crop rotation helps the Schefers control insects and weeds, reduces their costs, and lowers the need to buy pesticides and pest-resistant seeds.

Minimum tillage

The Schefers have been using minimal tillage for over a decade and found the practice reduces their workload, erosion, and need for chemicals, all while helping to improve their soils and yields.

Grid testing and variable rate technology

The Schefers followed best management practices for nutrient application but learned they were overapplying phosphorus and nitrogen after they started working with a crop consultant. The grid sampling of their fields led them to apply nutrients with variable rate technology and to make sure their fields are getting just the right amount of nutrients.

Grassed waterway buffers

The water from the farm runs into the Sauk River, and the Schefers installed buffers to help reduce runoff.

Manure stacking slab

The Schefers were assisted by their local conservation district to install a stacking slab in 2016 at the same time that they qualified for the Minnesota Ag Water Quality Certification Program.

Moving into the Future

With three of the four farmers in their sixties, the Schefers plan to stop milking within the next few years to make their workloads more manageable. With more time, they would like to expand with strip tilling or cover crops.

"It really takes a village to do just about anything [including farming]. Everybody kind of pitches in on this stuff."

Main Takeaways

Minimum tillage and a diverse crop rotation that includes alfalfa has helped the Schefers build up their soil, reduced their need for pesticides and resistant seed, and has helped them maintain profitability even in years with variable weather.

WHAT'S NEW ON THE FARM?

Ben Mergen

Mergen Acres

Featured in the 2021 report, Ben Mergen continues to experience success with strip tilling at his farm. At the end of the 2023 growing season, he will test strip tilling in the fall rather than spring. He planted winter camelina, winter rye, and field peas in his fields during winter 2023. The following cold and wet spring presented challenges for growing these crops, but Mergen still plans to incorporate them into his rotation for the next growing season by experimenting with earlier planting.

Tom Gregory

Mill Creek Dairy

Tom Gregory continues using rye as a cover crop - seeding 150 acres in 2022. Beginning in 2020, he hired a planter. They have expanded the no till work, which has been helped by having precise data on the corn fields. Planting rates based on precision data allows Gregory to make in-cab adjustments when putting in seed. He plans to soon install irrigation sensors and more efficient three-phase fans and lights to reduce electricity use in the milking shed.

Tim Kerfeld

Kerfeld Hill-View Farm

Since 2020, Tim Kerfeld has expanded no till rather than conservation tillage at his farm and helped nine other farmers who are his customers make the transition. He also refined his cover crop usage — planting ryegrass, kale, and oats for the timing of their growing seasons. Noting that no till has been more difficult in drought years, Kerfeld is considering adjustments. He recently bought a larger machine to allow for vertical till and no till. Purchasing a no-till planter to help with the challenges of getting the crops in the ground is part of the farm business plan.

METHODOLOGY

When analyzing practice impacts, we assessed for the impact of several practices types including contour strip cropping, cover crops, filter strips, grassed waterways and sediment control basins. The farms in this study employed these and other practices to varying degrees. Therefore, the practice impact data provides a general sense of the effect of practice adoption but is not a complete representation of the farms' soil erosion or soil carbon score.

Financial

WHAT: A farm financial software

WHY: Investigate effects of conservation on farm budgets

HOW: Financial assessment and planning with a Farm Business Management instructor to assess inputs, outputs, and profitability

TOOL: Farm Business Management provided by AgCentric

agcentric.org/farm-business-management

Water Quality

WHAT: A voluntary state program

WHY: Certification available to Minnesota farmers through the Minnesota Department of Agriculture

HOW: Science-based best management practices that contribute to water quality

TOOL: Minnesota Agriculture Water Quality Certification provided by Minnesota Department of Agriculture, Clean Water Land & Legacy and MN Water Quality Certified Farm

mda.state.mn.us/environment-sustainability/minnesota-agricultural-water-quality-certification-program

Sustainability

WHAT: A national sustainability assessment program

WHY: Sustainability tool that provides detailed assessment

HOW: Soil carbon, soil conservation, greenhouse gases, water quality

TOOL: Fieldprint® Calculator provided by Field to Market

calculator.fieldtomarket.org

What

Demonstrate the profitability of on-farm conservation to understand the connection between farm finances and conservation.

How

1. Use metrics from established financial and sustainability programs.
2. Analyze metrics by whole farm and individual crops.

READING THE DATA RESULTS

Many factors determine success for a farmer's operation including precipitation frequency and amount, growing season length, commodity prices, and fuel and equipment costs. Financial and environmental outcomes are measured for the farms participating in the project. These definitions provide an understanding of the data insights highlighted in the report.

- **Gross return** - total return on investment per acre before the deduction of any input costs or expenses.
- **Net return** - return per acre after the subtraction of expenses and fees from gross return.
- **Yield** - total tons of crop per acre of land.
- **Soil carbon** - the capacity of soil to store carbon and keep it from our atmosphere.
- **Soil erosion** - the amount of soil in tons that is lost to erosion per acre, per year.
- **Cost of production** - the total costs invested in production per acre.
- **Greenhouse gases** - the total carbon dioxide equivalent to use to measure and compare the emissions from various greenhouse gases produced on a farm as a single number in pounds of carbon dioxide emissions.
- **Water quality** - a score given to farms based on the number of conservation practices that improve water quality or reduce runoff into surrounding waters.

DATA INSIGHTS

Data on 10 farms for four different crops - alfalfa, corn grain, corn silage, and soybeans was analyzed again in 2022. When analyzing practice impact, we assessed the impact of contour strip cropping, filter strips, grassed waterways, and sediment control basins. On-farm sustainability benchmarks were developed from Field to Market's Fieldprint® Platform data outputs. The benchmarks represent the median farm for each crop enterprise in Stearns County, Minnesota, the county most participating farms are in.

NOTE: In the four crop results charts, the third column in the table represents the difference between benchmark farm operations and farms participating in the return-on-investment project.

NOTE: The Field to Market score range for water quality is 0-4. In each results chart, we include a score for all farms and a second one for farms without the Minnesota Agricultural Water Quality Certification Program (MAWQCP). The MAWQCP applies to six of 10 farms participating in the return-on-investment project.

2022 ALFALFA RESULTS

Alfalfa is an excellent food source for dairy cows. Cows efficiently use the high levels of protein, calcium, and high-quality fiber in alfalfa for producing milk. Gross return for alfalfa on participating farms was 24% higher per acre than benchmark farms and net return was significantly higher at 105% per acre above benchmarks. Cost of production was 37% less per ton of alfalfa, while yield was 48% higher per acre.

Soil conservation was improved by 44% over benchmark farms in the region, soil carbon capacity improved by 17%, and water quality improved by 9.6% for farms that have AgWater Certification. Greenhouse gas emissions were 13% lower than benchmark farms.

Summary stats include: 686 ACRES 33 FIELDS

	Benchmark farms	Participating farms	Difference
Gross return ($/acre)	737.16	916.33	↑ + 179.17
Net return ($/acre)	206.58	423.27	↑ + 216.69
Yield (ton/acre)	4.87	7.23	↑ + 2.36 bu per acre
Soil carbon capacity	0.30	0.35	↑ + 0.05
Soil erosion (ton/acre/year)	2.00	1.13	↓ - 0.87
Cost of production ($/ton)	128.26	80.98	↓ - 47.28 per ton
Greenhouse gases (lbs CO_2e/ton)	236	267	↑ + 31 lbs CO^2e/ton
Water quality	2.7	**All farms:** 2.97 **No MAWQCP:** 2.93	**MAWQCP certified:** 9.32 **Certification Eligibility Minimum:** 8.5

2022 CORN GRAIN RESULTS

Cereal grains like corn provide most of the starch in dairy cattle diets. Gross return for corn grain on participating farms was 6% lower per acre than benchmark farms and net return was significantly lower, 33% per acre below benchmarks. Cost of production was 16% more per ton of corn, while yield was 3% higher per acre. Lower-than-benchmark numbers for corn grain in this year's report is likely because some farms were more negatively impacted by the drought. Some participating farmers are still in the early adoption stage of these practices, and it can take time to built the health of the soil. There may be increased short-term risks, but it is expected that these crop systems will become more resilient over time. A larger sample size and more years of data is needed to know the long-term impacts of these practices. Participation in the project is growing; total acres increased this year 360% - from 187 acres to 861. Farms with conservation practices included in the benchmark farms increased by 30%.

Environmental outcomes for corn grain were all better than benchmarks. Soil conservation improved by 42% over benchmark farms in the region, soil carbon capacity improved by 60%, and water quality by 8.7%. Greenhouse gas emissions were the same as benchmark farms.

Summary stats include: 861 ACRES 34 FIELDS

	Benchmark farms	Participating farms	Difference
Gross return ($/acre)	1,146.32	1,078.92	↓ - 67.40
Net return ($/acre)	354.06	238.37	↓ - 115.69
Yield (bu/acre)	180.27	185.33	↑ + 5.06 bu per acre
Soil carbon capacity	0.50	0.80	↑ + 0.3
Soil erosion (ton/acre/year)	1.30	0.75	↓ - 0.55 per ton
Cost of production ($/bu)	4.38	5.08	↑ + 0.7 per bu
Greenhouse gases (lbs CO_2e/bu)	9	9	0 lbs CO^2e/bu
Water quality	1.06	**All farms:** 1.50 **No MAWQCP:** 1.11	**MAWQCP certified:** 9.24

2022 CORN SILAGE RESULTS

Corn silage is produced to feed dairy cows. When corn is harvested to produce silage, the entire plant is chopped into pieces and none of the plant is wasted. Gross return for corn silage on participating farms was 18% higher per acre than benchmark farms and net return was significantly higher at 216% per acre above benchmarks. Cost of production was 9% less per ton of corn silage, while yield was 19% higher per acre.

Environmental outcomes for corn silage saw mixed improvement with soil conservation improved by 6.5% over benchmark farms in the region, soil carbon capacity improved by 1%, and water quality improved by 8.4% for farms with AgWater Certification. Greenhouse gas emissions were 18.2% higher than benchmark farms.

Summary stats include: 946 ACRES 39 FIELDS

	Benchmark farms	Participating farms	Difference
Gross return ($/acre)	920.00	1,089.56	↑ + 169.56
Net return ($/acre)	120.49	380.19	↑ + 259.70
Yield (bu/acre)	21.00	24.90	↑ + 3.90 bu per acre
Soil carbon capacity	0.30	0.33	↑ + 0.03
Soil erosion (ton/acre/year)	2.30	2.15	↓ - 0.15 per ton
Cost of production ($/ton)	41.61	38.09	↓ - 3.52 per ton
Greenhouse gases (lbs CO_2e/ton)	66	78	↑ + 12 lbs CO^2e/ton
Water quality	0.9	**All farms:** 1.41 **No MAWQCP:** 0.92	**MAWQCP certified:** 9.21

2022 SOYBEAN RESULTS

Soybeans are used as feed on dairy farms and can be processed to make soybean meal for cows. Crop farmers use soy rotations in corn fields to naturally restore nitrogen in the soil and break weed and disease cycles. Gross return for soybeans on participating farms was 12% lower per acre than benchmark farms and net return was significantly lower at 88% per acre below benchmarks. Cost of production was 50% more per ton of soybeans, while yield was 8% lower per acre. Lower-than-benchmark numbers for soybeans in this year's report is likely because certain farms were more negatively impacted by the drought. Some participating farmers are still in the early adoption stage of these practices, and it can take time to build the health of the soil . There may be increased short-term risks, but it is expected that these crop systems will become more resilient over time. A larger sample size and more years of data is needed to know the long-term impacts of these practices. Acres this year increased 328% - from 352 acres to 1,506. Farmers with conservation practices included in the benchmark increased by 30%.

Environmental outcomes for soybeans were mostly better than benchmark farms. Soil conservation improved by 15%, soil carbon capacity decreased by 20%, and water quality improved by 8.8% for farmers with AgWater Certification and 24% for non-certified farms. Greenhouse gas emissions were 5% lower than benchmark farms.

Summary stats include: 1,506 ACRES 22 FIELDS

	Benchmark farms	Participating farms	Difference
Gross return ($/acre)	712.27	626.76	↓ - 85.51
Net return ($/acre)	257.15	30.82	↓ - 226.33
Yield (bu/acre)	49.56	45.76	↓ - 3.80 bu per acre
Soil carbon capacity	0.50	0.40	↓ - 0.1
Soil erosion (ton/acre/year)	1.30	1.10	↓ - 0.2 per ton
Cost of production ($/bu)	9.18	13.79	↑ + 4.61 per bu
Greenhouse gases (lbs CO_2e/bu)	23	24	↑ + 1 lbs CO^2e/bu
Water quality	1.5	**All farms:** 1.57 **No MAWQCP:** 1.25	**MAWQCP certified:** 9.25

CONCLUSIONS

The data and stories from participating farmers show a connection between profitability and environmental stewardship. The report demonstrates that most participating farmers had higher environmental and financial benefits than regional benchmarks. Overall soil health was improved through increased soil carbon and decreased soil erosion, findings that align with other research on the relationship between conservation practices and farm profitability.

Despite the overall positive results, the data indicates there may be increased short-term risks for farmers who recently adopted conservation practices because it can take time to build the health of the soil and there are upfront costs with changing practices. In the long-term these practices help build a more resilient agriculture system, but more data is needed here. Trends over the past four years of the study demonstrate that participating farmers experienced higher returns and increased crop yields, with lower production costs.

Available on the Environmental Initiative website

- 2021 report
- 2019-20 report
- Featured farmers and their farms

Trends

SOIL CARBON AND ORGANIC MATTER INCREASING

ACRES ENROLLED 3999

INCREASE IN ACRES WITH CONSERVATION PRACTICES 128% increase from last year

NET RETURN 14% over benchmarks

COST OF PRODUCTION 5% less than benchmarks

SOIL EROSION 34% less than benchmarks

YIELD 3% more than benchmarks

FOR MORE INFORMATION

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APPENDIX: CONSERVATION PRACTICE LIST

- Buffer strips
- Contour strips
- Cover crops
- Crop diversification
- Crop rotation
- Energy efficient lighting
- Filter strips
- Grass waterways
- Grid testing
- Habitat preservation
- Manure management
- Minimal till
- No till
- Nutrient management
- Perennial plantings
- Prairie strips
- Prescribed grazing
- Reduced irrigation
- Ridge till
- Runoff prevention
- Sediment control basins
- Semi-rotational grazing
- Strip-till system
- Variable rate technology

RETURN ON INVESTMENT PROJECT

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Data team

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- Compeer Financial (funder)
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- Houston Engineering (funder)
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- Midwest Dairy (funder)
- Minnesota Agricultural Water Quality Certification Program
- Minnesota Department of Agriculture (funder)
- Minnesota Milk
- Minnesota Rural Water Association
- The Nature Conservancy (funder)
- Nature Energy
- SLP, LLC (funder)
- Stearns County Soil and Water Conservation District
- Steve Schlangen
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- USDA Natural Resource Conservation Services (funder)