Final Abstract

Final Report Approved on August 5, 2025

M.L. 2020 Project Abstract

For the Period Ending June 30, 2025

Project Title: Developing Cover Crop Systems For Sugarbeet Production

Project Manager: Anna Cates

Affiliation: U of MN - College of Food, Agricultural and Natural Resource Sciences

Mailing Address: 1991 Upper Buford Circle 493 Borlaug Hall

City/State/Zip: St Paul, MN 55108

Phone: (612) 625-3135

E-mail: catesa@umn.edu

Website: https://cfans.umn.edu/

Funding Source:

Fiscal Year:

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 08e

Appropriation Amount: $300,000

Amount Spent: $300,000

Amount Remaining: -

Sound bite of Project Outcomes and Results

UMN researchers found that cover crops planted before or after sugarbeets had no effect on sugarbeet yield or quality in Western or Northwestern Minnesota. Wind erosion was reduced in cover cropped fields, suggesting that these practices can lower sediment and nutrient loss from agricultural areas while protecting productivity.

Overall Project Outcome and Results

Over three years of field trials on farms and the UMN Research and Outreach Center in Crookston, MN, we found minor to non-existent effects of cover crops on agronomic outcomes, suggesting that growers can adopt these practices at low risk. Sugarbeet yield and quality were not affected by cover crops planted before sugarbeets in Western or Northwestern Minnesota. Cover crops before beets included a winterkilled mix of oat and radish, winter-killed oat alone, hairy vetch, and cereal rye, compared with a standard practice of spring-seeding oat as a nurse crop alongside sugarbeets. Cover crops after beets, a window prone to erosion, also did not alter sugarbeet yield and quality in Western or Northwestern Minnesota.Cover crops intereseeded into growing beets did not survive harvest activities, while cover crops drilled after sugarbeet harvest produced more biomass to protect the soil over the fall, winter, and following spring. Cover crops included interseeded cereal rye, interseeded mustard, and cereal rye drilled after harvest. Soil health

parameters including soil organic matter pools, infiltration rate, and runoff, were not affected by cover crops planted before or after sugarbeets in Western or Northwestern Minnesota.
Cover crops did lower wind eroded sediment measurements over the winter season, especially in years and sites with low snow cover and low precipitation. Eroded sediment was over 8% organic matter, suggesting that the most fertile part of the soil is vulnerable to loss. Cover crop was cereal rye, drilled after beet harvest, on farm fields in Renville and Polk Counties in 2022-23 and 2023-24. Erosion was much higher in both locations in 2023-24 due to windier, drier conditions with minimal snow cover over soil.

Project Results Use and Dissemination

Over 120 producers and local agricultural advisors engaged with research results at in-person workshops in five counties featuring researchers and farmer experience. Employees at three major beet processing companies were exposed to strip-till beets through winter presentations and field days at the Northwest Research and Outreach Center. Over the course of the research, more strip-till machines have been purchased across the study area, suggesting that the LCCMR results, along with information from Extension and other sources, have increased adoption of this soil-friendly practice.

Environment and Natural Resources Trust Fund

M.L. 2020 Approved Final Report

General Information

Date: September 22, 2025

ID Number: 2020-012

Staff Lead: Noah Fribley

Project Title: Developing Cover Crop Systems For Sugarbeet Production

Project Budget: $300,000

Project Manager Information

Name: Anna Cates

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

Office Telephone: (612) 625-3135

Email: catesa@umn.edu

Web Address: https://cfans.umn.edu/

Project Reporting

Final Report Approved: August 5, 2025

Reporting Status: Project Completed

Date of Last Action: August 5, 2025

Project Completion: January 31, 2025

Legal Information

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 08e

Appropriation Language: $300,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to develop agronomic guidelines to support growers adopting cover-crop practices in sugar beet production in west-central and northwest Minnesota.

Appropriation End Date: June 30, 2024

Narrative

Project Summary: Evaluate effective ways to protect soil from erosion in sugarbeet production, with the long-term goal of slowing soil degradation, nutrient loss, and water quality.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Wind erosion in western MN averages 3-8 tons/acre per year. A cover crop planted the fall before sugarbeets should protect the soil as well as protect sugarbeet seedlings. No research has been done to evaluate erosion protection due to fall vs spring-seeded cover crops before sugarbeets. It is critical to quantify nutrient losses from sugarbeet fields in this region in order to meet Minnesota's Nutrient Reduction Strategy targets for the Red River Valley (10% in phosphorous and 13% in nitrogen by 2025). Researchers have noted that a high-residue fall cover crop suppressed weeds, which is of critical importance as growers struggle with increasing herbicide resistance in weed populations. In addition, fall-planted cereal rye reduces soil nitrate, which increases sugarbeet quality and reduces potential for nitrate leaching to ground and surface water.

Erosion is an even more difficult problem following sugarbeets in rotation. Sugarbeets are destructively harvested late in the fall, leaving soil exposed to fall, winter, and spring erosion. However, seeding cover crops which survive sugarbeet harvest has the potential to increase fall residue cover of the soil which would slow wind and water speeds, reducing erosion, potentially suppressing weeds.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

- In West-Central Minnesota, interseeding cover crops with strip-tilled corn prior to sugarbeets could reduce spring soil loss and save farmers time and money.
- In Northwest Minnesota, late-summer harvest of winter wheat provides an excellent window for establishment of pre-beet cover crops.
- In both regions, interseeding cover crops into standing beets will reduce fall erosion.

Successful fall cover crops reduce soil, phosphorous and nitrogen losses during the fallow period, an opportunity for savings on fertilizer costs while improving water quality. In addition, a robust pre-beet cover crop could suppress competitive herbicide-resistant weeds, which are spreading throughout the state. In order to mitigate risk for farmers adopting these new practices, our research will evaluate different planting and termination timings and methods and develop initial recommendations. We will establish large-scale on-farm trials and plot-scale trials to evaluate regionally-specific systems for sugarbeet yield and quality, troubleshoot agronomic best practices, and measure soil health metrics, wind erosion, surface runoff, and associated nutrient loss. Growers are duly wary of adopting new practices without a clear understanding of the benefits and risks, so this groundwork is necessary for workshops, technical assistance, and promotion of sustainable sugarbeet production in Minnesota.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

This data will be used to promote adoption of cover cropping in sugarbeets to reduce erosion by wind and water, which enhance nutrient delivery to Minnesota's surface water. As sugarbeets are grown in rotation with other crops, other relevant agricultural conservation practices will be discussed at field days and in publications, using this research as leverage to promote soil and water conservation in the West-central and NW regions of Minnesota.

Project Location

What is the best scale for describing where your work will take place?

Region(s): NW, Central,

What is the best scale to describe the area impacted by your work?

Region(s): NW, Central,

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: Central Minnesota: Integrating cover crops in strip-till corn-sugarbeet crop rorations

Activity Budget: $100,000

Activity Description:
We will evaluate four treatments for soil protection and agronomic best practices: (1) pre-beet cover (rye and Austrian winter pea) interseeded between strip-tilled corn rows, (2) post-beet cover sewn after beet harvest, (3) nurse crops sewn at beet planting, and (4) no cover crops. Growers with the Southern Minnesota Beet Sugar Cooperative have agreed to host large on-farm trial plots, and SMBSC has agreed to support the logistics of research including beet yield and quality sampling. We will use dust collectors and/or erosion mats to quantify soil and nutrients lost to wind erosion and will measure soil health metrics (biologically active soil C and N). Yields of beets and corn will be evaluated using farmers' combine or weigh wagon data, and a subsample of beets and wheat will be taken from each plot to evaluate quality. Cover crop success will be quantified by harvesting biomass and photographing ground cover; weeds by estimating emergence. Field days and grower meetings will be held each year to address grower concerns and share best management practices developed.

Activity Milestones:

Description	Approximate Completion Date
Interseed pre-beet covers, evaluate fall ground cover and soil erosion (2022 and 2023)	December 31, 2023
Evaluate sugarbeet yield and quality (2022 and 2023)	December 31, 2023
Evaluate spring cover, spring erosion, and plant sugarbeets (2022-2024)	June 30, 2024
Field days and winter meetings to disseminate results	June 30, 2024

Activity 2: Northwest Minnesota: Integrating cover crops in wheat-sugarbeet rotations

Activity Budget: $200,000

Activity Description:
We will evaluate four treatments for soil protection and agronomic best practices: 1) pre-beet cover sewn after wheat; 2) post-beet cover intereseeded before beet harvest; 3) no cover beets. Growers with American Crystal Sugar have agreed to host large on-farm trial plots, and ACS has agreed to support the logistics of research including beet yield and quality sampling. We will use dust collectors and/or erosion mats to quantify soil and nutrients lost to wind erosion and will measure soil health metrics (biologically active soil C and N). Yields of beets and wheat will be evaluated using farmers' combine or weigh wagon data, and a subsample of beets and wheat will be taken from each plot to evaluate quality. Cover crop success will be quantified by harvesting biomass and photographing ground cover; weeds by estimating emergence. Field days and grower meetings will be held each year to address grower concerns and share best management practices developed.
In addition, a small-plot study at Crookston NWROC will evaluate the same treatments, and be split to evaluate 2-5 different cover crop species for pre-beet and post-beet windows. Evaluation of soil and environmental indicators will proceed as in on-farm plots.

Activity Milestones:

Description	Approximate Completion Date
Establish pre-beet covers, evaluate fall ground cover and soil erosion (2022 and 2023)	December 31, 2023
Evaluate sugarbeet yield and quality (2022 and 2023)	December 31, 2023
Evaluate spring cover, spring erosion, and plant sugarbeets (2022-24)	June 30, 2024
Field days and winter meetings to disseminate results	June 30, 2024

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Lindsay Pease	NW Research and Outreach Center	Assistant Professor and Extension Specialist of Nutrient and Water Management, Department of Soil, Water, and Climate, UMN, Crookston, MN. Lead on Crookston site management, surface runoff measurements, graduate student co-advisor.	Yes
Jodi DeJong-Hughes	University of Minnesota Extension	Regional Extension Educator in Crops and Soils, lead on Central MN work.	Yes
Dorian Gatchell	MN Ag Services	Farmer contact and field work support in central MN work.	Yes
Dr. Thomas Peters	North Dakota State University and University of Minnesota	Extension Sugarbeet Agronomist, will lead weed pressure evaluation.	No
Todd Cymbalak	American Crystal Sugar	Cymbalak identified NW MN growers, and will coordinate plot data collection including sugarbeet yield and quality metrics.	No
David Mettler	Southern Minnesota Beet Sugar Cooperative	Mettler helped identify cooperators and will coordinate harvest data collection including yield and beet quality.	No
Leah Grim	UMN	Help to collect and analyze samples for soil health indicators.	Yes
Graduate research assistant	UMN	Collect and analyze field data including water quality and soil health metrics.	Yes
Heidi Reitmeier	UMN, NW Research and Outreach Center	Technician to collect field data and analyze water quality samples.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
Farmers have been active participants in the design of this research. Meetings were first held with growers and beet sugar coop owners in 2018 to discuss proposed research goals and protocols. This ensures that beet growers have buy-in and capacity for the research goals, and the acres in beet rotation are more likely to adopt innovations generated by this research.
UMN Extension and our collaborator with NDSU Extension have established networks for field days and publication dissemination, so ongoing and final results can be easily shared with agricultural stakeholders around the state. Given the importance of agricultural lands for water quality across Minnesota, this is the critical audience fort his work.
We understand the ENTRF Acknowledgement Guidelines, and will include language, logo, and social media tags as appropriate for each outreach activity.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

This project addresses basic questions of cover crop management for sugarbeets; however, we expect to refine these systems. All personnel will disseminate these results through field days on farms, at the NWROC Crop and Soils Field Day, UMN-Extension website, two peer-reviewed research publications, at winter beet Grower's Seminars and ACS's "Way to Grow" series. Federal, cost-share is available to individual growers for cover cropping. Commodity crop organizations including the Sugarbeet Research and Education Board, MN Wheat, MN Soybean Growers Association, and MN Corn Growers Association fund cover crop research which may be used to address questions raised here.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount	$ Amount Spent	$ Amount Remaining
Personnel										
Professiona and Admin		PI			26.7%	0.03		$2,796	-	-
Professional and Admin		Scientific Leadership			26.7%	0.13		$15,789	-	-
Professional and Admin		Scientific and Field Leadership			32.6%	0.07		$7,054	-	-
Graduate Student		Data collection and analysis			46.6%	1.25		$125,114	-	-
Researcher		Lab and field technical support			33.5%	0.5		$19,737	-	-
Researcher		Lab and field technical support			24.1%	0.38		$7,681	-	-
Undergraduate researcher		Lab and field work			0%	1.05		$41,270	-	-
							Sub Total	**$219,441**	**$219,441**	**-**
Contracts and Services										
MN Agricultural Services, Dorian Gatchell	Professional or Technical Service Contract	Soil sampling, erosion monitoring, yield sampling at $25/hour for 60 hours/year for 2 years. Gatchell has MS in Agronomy, owns soil sampling equipment, works closely with farmers, and has years of experience with research protocols.		X		0.05		$3,500	$3,500	-
Soil sample analysis	Professional or Technical Service Contract	C and N analysis for all plots, all fields, multiple soil organic matter pools, to provide insight on where soil C is stored in different cover crop systems. More samples were collected than anticipated				0		$18,624	$18,624	-
Water sample analysis	Professional or Technical Service Contract	At Crookston NWROC plots only, collect runoff samples approximately monthly to represent key points during the growing season (e.g. pre/post planting, pre/post cover crop interseeding). 9 samples/year * $5/sample * 20 plots * 2 years.				0		-	-	-

		All samples were analyzed in house, so these funds were re-allocated to supplies								
							Sub Total	**$22,124**	**$22,124**	**-**
Equipment, Tools, and Supplies										
	Tools and Supplies	Field supplies for 101 plots, $2200/year	Field flags to mark plots, soil sampling bags, maintenence and repair of soil samplers, fabrication of strip-till tool bar, field fees for NWROC land use					$3,278	$3,278	-
	Tools and Supplies	Dust collectors, total 18 masts and 54 pans, manufactured and repaired	To measure wind erosion on selected on-farm plots, collecting sediment for analysis of total organic matter, pest presence, and nutrients.					$13,071	$13,071	-
	Tools and Supplies	Cover crop seed, including rye and barley in on-farm trials, rye, barley, mustard for NWROC trials and on-farm trials	This seed should be sufficient to supply all farmers with uniform seed supplies to apply treatments.					$1,995	$1,995	-
	Tools and Supplies	2 sprinkle infiltrometers, $1450 apiece, plus shipping, plus materials for repairs and replacement parts	To measure infiltration and runoff at all plots, allowing collection of water samples for nutrient analysis, and showing the resiliency of soil structure to rainfall.					$4,889	$4,889	-
	Tools and Supplies	Lab supplies for in-house soil analysis, 2 years of data on soil health metrics	Samples will be analyzed for biological activity, structure and organic matter					$4,000	$4,000	-
	Tools and Supplies	Field day expenses will be covered by other funding sources	Porta-potty rental ($200/day), videographer for 1 event ($1500) to share practices with UMN Extension's online audience					-	-	-
							Sub Total	**$27,233**	**$27,233**	**-**
Capital Expenditures										

							Sub Total	**-**	**-**	**-**
Acquisitions and Stewardship										
							Sub Total	**-**	**-**	**-**
Travel In Minnesota										
	Miles/ Meals/ Lodging	Approximately 65 trips/year of varying lengths, $0.675/mile, plus lodging ($1000) and meals ($700)	Travel sampling, project team meetings, and field days will mostly consist of day trips, except for St. Paul-based personnel to spend nights in Crookston for harvest and field days, and Crookston-based personnel to spend nights in St. Paul for meetings.					$22,546	$22,546	-
							Sub Total	**$22,546**	**$22,546**	**-**
Travel Outside Minnesota										
	Conference Registration Miles/ Meals/ Lodging	2 trips at $1500/trip	PI or graduate student will present results and national or regional meetings devoted to soil health, agronomy, and/or water quality	X				$2,797	$2,797	-
							Sub Total	**$2,797**	**$2,797**	**-**
Printing and Publication										
	Printing	Research reports and field day handouts, ~2 posters @~100 apiec	Growers still appreciate paper copies of research results, which will be mailed to participating growers, and summarized for the field day audience					$209	$209	-
							Sub Total	**$209**	**$209**	**-**
Other Expenses										

		Farmer stipend, $850/pre-beet experiment site *4 site-years, $750/post-beet site * 4 site-years	To compensate farmers for use of their land and their participation in the project.					$5,650	$5,650	-
		No equipment rental was needed	Farmers who are experimenting with these practices must hire proper equipment to apply field treatments.					-	-	-
							Sub Total	**$5,650**	**$5,650**	**-**
							Grand Total	**$300,000**	**$300,000**	**-**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Contracts and Services - MN Agricultural Services, Dorian Gatchell	Professional or Technical Service Contract	Soil sampling, erosion monitoring, yield sampling at $25/hour for 60 hours/year for 2 years. Gatchell has MS in Agronomy, owns soil sampling equipment, works closely with farmers, and has years of experience with research protocols.	Gatchell's specific experience with growers and research in central MN makes him a critical asset to the project. The price is competitive for his level of experience and education, as soil sampling alone could cost $25/hour for some one with the appropriate equipment and expertise.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	2 trips at $1500/trip	Minnesota is a major player in the beet-growing industry, which holds regional meetings to share best practices. In order to reach all top Minnesota personnel as well as a relevant wider audience, project personnel should be prepared to present their results at these national and regional meetings. This legitimizes the project in the wider industry and amplifies our impact on water quality and soil conservation. Specifically, project personnel will attend the Midwest Cover Crops Council annual meeting, the Soil Science Society of America annual meeting, and the Sugarbeet Research and Education Board annual meeting, where they will present results from this study.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount	$ Amount Spent	$ Amount Remaining
State						
			State Sub Total	**-**	**-**	**-**
Non-State						
Cash	Sugarbeet Research and Education Board	Research team will finish data collection on beets planted in spring 2024 after cover crops at the NWROC research station and on-farm locations in Polk, Wilkin, and Swift counties. Funds will cover personnel, supplies and travel for data analysis and collection. This will complete the picture for the final report to LCCMR, including analysis of soil and water samples collected in spring 2024, and harvest data from 2024 beets.	Secured	$22,725	$3,218	$19,507
			Non State Sub Total	**$22,725**	**$3,218**	**$19,507**
			Funds Total	**$22,725**	**$3,218**	**$19,507**

Attachments

Required Attachments

Visual Component

File: 87560803-874.pdf

Alternate Text for Visual Component

Cover crops provide ground protection and take up nutrients when summer cash crops are not growing. Without cover crops, erosion transports N and P to waterways and leaves degraded soil....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Cates background check	82e50573-35b.pdf
Soil health in beets flier	08ae6a22-4f2.pptx
Cates on Red River Farm Network Jan 2024	de3c63d2-38e.pdf
SBREB final report	9d3b5940-968.docx
SBREB final presentation	4006fd89-a7c.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Adjusted budget to reflect recommended funding of $300,000. Responded to comments and revisions.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the UMN Policy on travel applies.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Explanation & justification for Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Amendment Request	• Budget - Personnel • Budget - Professional / Technical Contracts • Budget - Capital, Equipment, Tools, and Supplies • Budget - Travel and Conferences • Budget - Other	Cates adjusted budget to reflect re-distribution of workload among staff, including more time from the graduate student, one staff member and contractor with slightly less time for another staff member. Travel is overall reduced but 3 more out-of-state trips were added to present project results. The re-allocation of supplies allows for more samples analyzed in private labs than in-house based on interest in soil carbon.Farmer payments decreased due to lower participation than planned.	February 2, 2024	Yes	February 23, 2024
2	Completion Date	Previous Completion Date: 06/30/2024 New Completion Date: 01/31/2025	Data will be collected from fields in ~Sept-Oct 2024 (using other funding, which will be added to the Non-ENTRF Funds Contributed section during a final rebudget in June 2024) and the final report should include analysis of this data.	May 23, 2024	Yes	May 28, 2024
3	Amendment Request	• Budget • Budget - Personnel • Budget - Professional / Technical Contracts • Budget - Capital, Equipment, Tools, and Supplies • Budget - Travel and Conferences • Budget - Printing and Publication • Budget - Other • Budget - Non-ENRTF Funds Contributed	Budget adjusted to account for winter and spring travel and analysis costs, reflecting expenses incurred now to aid in analysis during the extended reporting period where personnel and travel will be funded by SBREB grant 3/24-03/25. Travel is slightly increased, personnel budget is allocated to graduate and undergraduate student time, and adequate supply and analysis budget are included. Farmer and seed payments were adjusted to reflect invoices received in spring 2024.	June 11, 2024	Yes	July 12, 2024

Status Update Reporting

Final Status Update March 17, 2025

Date Submitted: May 21, 2025

Date Approved: July 16, 2025

Overall Update
The sugarbeet community is clearly interested in the solutions we're proposing for soil health. Our erosion data is of high interest to communities in NW MN, and we anticipate that it will help local policy-makers justify cost share on cover crops after sugarabeets despite apparent low plant populations.

Activity 1
Across on-farm trials in Swift, Wilkin, and Polk county we found comparable sugarbeet yield after spring- or fall-planted cover crops. However, we also found no effect of cover crops on soil health parameters including infiltration, aggregation, soil protein, and soil organic matter pools.
For cover crops planted after beets in on-farm trials, we found dramatic drops in wind erosion with cover crops in 3/4 site-years across Renville and Polk counties. In the snowier conditions over winter 2022-23, we found no effect of cover crop on wind eroded sediment in Polk county. All other site-years were sufficiently open that we were able to detect lower wind erosion with cover crops.
(This activity marked as complete as of this status update)

Activity 2
At NWROC experiments evaluating cover crops before and after beets, we again found almost no differences in soil health properties. Soil at NWROC was generally sandier than other on-farm sites. Infiltration and runoff values were similar in plots with and without cover crops. Yield was generally lower at NWROC than on-farm sites, especially in the first year of the study. However, we found no effect of cover crops before or after beets on yield or sugar concentrations.
(This activity marked as complete as of this status update)

Dissemination
Pease delivered a final presentation to our other funders the Sugarbeet Research and Education Board, at the annual reporting session in Fargo in Jan 2025, and submitted our results as a report to that group as well. That group covers the major sugarbeet industry players across MN and ND, including farmer boards of the cooperative processors' associations. We believe that this has show the maximum number of relevant people the information we found.

Status Update Reporting

Status Update October 1, 2024

Date Submitted: October 7, 2024

Date Approved: November 19, 2024

Overall Update
Over the summer, soil health in sugarbeets has come up at several field days in western and NW MN. Sugarbeet growers are now accustomed to discussing strip-till as a potential management practice, with more questions about the "how" than the "why.

Activity 1
For cover crops planted after beets, all field data has been collected. Soil samples from dust collection devices are being analyzed by labs, while students are working through field soil samples at UMN. Funding from the Sugarbeet Research and Education Board is covering these activities.
For cover crops planted before beets, the beet harvest is underway at on-farm locations in Swift and Wilkin counties. Both cooperators have reported good harvest conditions and fairly good yields. Data has yet to be analyzed but no differences in yield are expected.

Activity 2
For cover crops planted after beets, all field data has been collected. Soil samples from dust collection devices are being analyzed by labs, while students are working through field soil samples at UMN. Funding from the Sugarbeet Research and Education Board is covering these activities.
For cover crops planted before beets, the beet harvest occurred at the NW Research and Outreach Center in mid-September. Data has yet to be statistically analyzed but no differences in yield are expected. Overall, yields are greater than 2023.

Dissemination
Pease presented on July 17 2024 at the NWROC Crops and Soils Day in Crookston (https://nwroc.umn.edu/events/2024-cropssoils-day). This was part of a half day focused on beets, where she discussed both cover crop successes and nutrient mineralization work funded by the Agricultural Fertilizer Research and Education Council that is taking place in the same plots. Growers were interested and engaged with the topic.

Additional Status Update Reporting

Additional Status Update July 29, 2024

Date Submitted: July 29, 2024

Date Approved: November 19, 2024

Overall Update
We have collected powerful data on wind erosion in sugarbeet systems, and had the opportunity to share those with the sugarbeet growing community. There has been definite increases in interest in these practices over the course of our research projects. Growers and companies are talking about how this could really work, and are excited to see our research showing neutral agronomic outcomes for more sustainable systems.

Activity 1
All post-beet cover crop experimental milestones have been achieved, though data analysis and writing up reports and publications is ongoing. Pre-beet cover crops were successfully terminated and the 2024 beet crop at on-farm research locations is growing successfully. Infiltration measurements and soil sampling was completed in June 2024 in the pre-beet cover crop plots.

Activity 2
All post-beet cover crop experimental milestones have been achieved, though data analysis and writing up reports and publications is ongoing. Pre-beet cover crops were successfully terminated and the 2024 beet crop at the NRWROC locations is growing successfully. Infiltration measurements and soil sampling was completed in June 2024 in the pre-beet cover crop plots.

Dissemination
We spoke about these plots at the Cover Crop Academy session at NWROC on June 20 (https://extension.umn.edu/courses-and-events/cover-crop-academy), and at the NWROC Crops and Soils Day July 17 (https://nwroc.umn.edu/events/2024-cropssoils-day). Both were well-attended and engaged crowds.

Additional Status Update Reporting

Additional Status Update August 14, 2024

Date Submitted: June 11, 2024

Date Approved: July 12, 2024

Overall Update
Our last field season is well underway, with samples taken in both regions. Cover crop growth over the 23-24 winter was good, so we expect more treatment differences in spring 2024. The new grant from Sugarbeet Research and Education Board will allow us to monitor the beet growing season through harvest, and complete data for 3 years of interseeded cover crops in beets at NWROC, and add 2 site-years evaluating cover crops before beets on farms.

Activity 1
Samples were taken and are in the midst of being processed. Wind erosion samples will be analyzed for nutrients this month, and infiltration and soil health data will be analyzed later in the summer season. Beets are planted.

Activity 2
Samples were taken and are in the midst of being processed. Wind erosion samples will be analyzed for nutrients this month, and infiltration and soil health data will be analyzed later in the summer season. Beets are planted.

Dissemination
Our winter events were well-received and we expect to highlight this research at two events in the NWROC this summer, June 20 and July 17.

Status Update Reporting

Status Update April 1, 2024

Date Submitted: April 23, 2024

Date Approved: April 26, 2024

Overall Update

In both regions, we have successfully began a second year of large on-farm test plots and small-plot research to evaluate the integration of cover crops with strip-till corn and wheat before sugarbeet, as well as the integration of cover crops after sugarbeet production. Data analysis is well underway for field experiments, and preparations are in motion for 2024 data collection. Specifically, erosion data were collected monthly over Nov 2023-April 2024. Sugarbeet yield and quality, infiltration and runoff data have been analyzed and presented internally.

One application for continued funding for the work was successful, with the Sugarbeet Research and Education Board funding continued data collection and analysis through March 2025. In addition, independent data collection on aerial seeding methods of cover crops was conducted with project partner West Polk SWCD and farmer collaborators.

Based on 2022-2023 data, we hosted ~150 growers and ag professionals to a series of 5 workshops on soil health in beets, highlighting both our research and relevant farmer experience with these practices. The workshops were well-received, serving growers across Central and Northwest MN.

Activity 1

For the on-farm pre-beet trial in NW MN, 2023 beet harvest was completed and quality successfully assessed on subsamples. However, some plots were mistakenly harvested too early to be part of the data. Data analysis of beet outcomes, soil health metrics, infiltration and runoff is ongoing. New plots for 2024 beets were established in fall 2025 with the seeding of rye cover crops, and spring cover crops were seeded in April 2024. Soil sampling, biomass collection, infiltration and runoff measurements will be completed in May 2024.

For the on-farm post-beet experiment, cover crops were established in strips and wind-transported soil samplers were installed in the fall of 2023 and monthly measurements were taken until ~April 2024. Soil sampling, biomass collection, infiltration and runoff measurements will be completed in May 2024.

At NWROC, cover crops were planted in fall 2023 in the fall of 2023 after wheat harvest and have been growing successfully.

Laboratory analysis of soil health indicators, and analysis of runoff and infiltration data, is ongoing.

Activity 2

For the on-farm pre-beet trial in West-Central MN, harvest was completed and quality successfully assessed on subsamples. Data analysis of beet outcomes, soil health metrics, infiltration and runoff is ongoing. New plots for 2024 beets were established in fall 2025 with the seeding of rye cover crops, and spring cover crops were seeded in April 2024. Soil sampling, biomass collection, infiltration and runoff measurements will be completed in May 2024.

For the on-farm post-beet experiment, cover crops were established in strips and wind-transported soil samplers were installed in the fall of 2023 and monthly measurements were taken until ~April 2024. Soil sampling, biomass collection, infiltration and runoff measurements will be completed in May 2024.

Dissemination

Based on 2022-2023 data, we hosted ~150 growers and ag professionals to a series of 5 workshops on soil health in beets, highlighting both our research and relevant farmer experience with these practices (see attached flier). The workshops were well-received, serving growers across Central and Northwest MN. Media interest was generated in the Red River Farm Network. In addition, Cates spoke about the project to grower groups in Fargo Jan 9 2024, graduate student Ozturk did a poster presentation in Nov 2023 at the American Society of Agronomy meetings, and Cates presented to the Southern MN Beet Sugar Cooperative team Jan 25 2024.

Post-beet cover crop data collection will be completed in summer 2024, and preparation on a peer-reviewed publication will begin at that time.

Additional Status Update Reporting

Additional Status Update January 26, 2024

Date Submitted: February 2, 2024

Date Approved: February 23, 2024

Overall Update
Cates initiated extra status report to accompany amendment adjustments.

Activity 1
Erosion monitoring is ongoing.

Activity 2
Erosion monitoring is ongoing.

Dissemination
Outreach events are scheduled for Feb 20, 21, and 26, March 5, and March 6.

Status Update Reporting

Status Update October 1, 2023

Date Submitted: September 28, 2023

Date Approved: November 9, 2023

Overall Update

We have evaluated the integration of cover crops in two different regions of Minnesota: Central Minnesota and Northwest Minnesota for the first year. In both regions, we have successfully established large on-farm test plots and small-plot research to evaluate the integration of cover crops with strip-till corn and wheat before sugarbeet, as well as the integration of cover crops after sugarbeet production. This approach shows promise in reducing spring soil erosion and supporting soil health.

The collaboration initiated by this grant has spurred other grant proposals lead by Pease and Cates, so we anticipate the effort ensure sustainable sugarbeet production will continue. The West Polk SWCD has added an aerial cover crop seeding demonstration trial, advised by Cates and based on our work. Our research is of interest to farmers, private companies, and government units interested in ensuring water quality in the Red River Basin.

Activity 1

For the on-farm pre-beet trial in NW MN,soil sampling, biomass collection, infiltration and runoff measurements were completed in the spring of 2023. Laboratory analysis for soil health indicators is underway, and sugar beet harvest for quality and yield was completed on September 20, 2023. At a new location, pre-beet cover crops will be established in fall of 2023.

For the on-farm post-beet experiment, wind-transported soil samplers were installed in the fall of 2022 and monthly measurements were taken until ~April 20223. Similar detailed soil sampling, biomass collection, infiltration and runoff measurements were completed in the spring of 2023. At new locations, dust samplers for the second year will be installed on September 30, 2023.

At NWROC, soil sampling, biomass collection, and field measurements were completed in pre-beet and post-beet cover crops. At new locations, beets were planted in May for a second year of the post-beet experiment, and cover crops were planted in fall 2023 in the fall of 2023 after wheat harvest.

Laboratory analysis of soil health indicators, and analysis of runoff and infiltration data, is ongoing.

Activity 2

At the on-farm pre-beet experiment, detailed soil sampling, biomass collection, field measurements including soil compaction, infiltration and runoff were conducted in spring 2023 prior to beet planting. Sugar beet harvest for quality and yield will be completed in October 2023.

At the on-farm post-beet experiment, wind-transported soil samplers were installed in the fall of 2022 and monthly measurements were taken until ~April 20223. Similar detailed soil sampling, biomass collection, infiltration and runoff measurements were completed in the spring of 2023. At new locations, dust samplers for the second year will be installed fall 2023.

Laboratory analysis of soil health indicators, and analysis of runoff and infiltration data, is ongoing.

Dissemination

Pease spoke about the project to ~30 growers in Wilkin County Augut 15. Cates and graduate student Mehmet Ozturk spoke to ~30 growers at a field day in Granite Falls, MN on Aug 16 about the wind erosion measured in the post-beet experiment. Cooperating SWCDs in Wilkin county, Renville county, and Traverse county have also highlighted many of the practices being tested here.

Status Update Reporting

Status Update April 1, 2023

Date Submitted: March 31, 2023

Date Approved: April 18, 2023

Overall Update

This project has catalyzed many conversations about conservation practices in sugarbeets. These have included industry representatives, farmers, and local government conservation agencies. Cates has given many presentations about erosion in general, and Cates and Pease both spoke at the Red River Basin Flood Reduction Workgroup Annual meeting about conservation practices. Getting conservation practices in the minds of growers and decision-makers in this region is an important step for farmer adoption.

Activity 1

In NW MN, we have established both pre-beet and post-beet cover crop trials on farms and at the NWROC. At the NWROC, our 2022 post-beet covers included interseeded between beet rows and drilled after beet harvest. The interseeding was not very successful, and we hope to improve this in 2023 by getting cover crops established earlier. Our pre-beet covers at NWROC included fall-seeded cereal rye and spring-seeded oat. 2022 beet yields at NWROC were not established.

On-farm, pre-beet cover crops (cereal rye) were established after wheat at one growers' field in replicated strips, and a spring-seeded treatment will also be added in 2023. Post-beet cover crops were established on one side of one growers' field, and wind erosion monitoring comparing cover crops and no cover crop has been conducted over the winter of 2022-23.

Infiltration and runoff was tested in all plots on farms and NWROC. 2023 beet yields will be collected at NWROC and on-farm.

We have highlighted this research at the West Polk monthly soil health meetings in winter 2022-23. We plan to try to recruit more growers for a post-beet experiment with aerial seeding to increase our on-farm trial data.

Activity 2

In Central MN, we have established on-farm pre-beet and post-beet cover crop trials. Pre-beet cover crops (cereal rye) were established at one growers' field in replicated strips, and a spring-seeded treatment will also be added in 2023. A second farmer who was excited to participate was not able to establish cover crops in the dry fall of 2023. Post-beet cover crops were established on one side of one growers' field, and wind erosion monitoring comparing cover crops has been conducted over the winter of 2022-23.

A field day highlighting this research is planned for August 16 2023.

Dissemination

Cates spoke at the Sugarbeet Research and Education Board annual meeting on the importance of soil health in Jan 2023, and will present first-year research results at the same meeting in 2024, as well as attending more local meetings of growers hosted by individual beet companies (American Crystal, Southern MN Beet Sugar Co). The West Polk SWCD monthly soil health meetings, Renville SWCD soil health meetings, and WIlkin SWCD soil health meetings have also highlighted many of the practices being tested here.

Status Update Reporting

Status Update October 1, 2022

Date Submitted: September 26, 2022

Date Approved: September 27, 2022

Overall Update
We have spoken to many growers about using cover crops in rotation with beets, and gained understanding of the barriers in both West-Central and Northwest MN. Research plots at the NWROC have been established to evaluate interseeding cover crops between beet rows.

Activity 1
We have recruited farmers to seed cover crops in strip-tilled corn systems prior to 2023 beets, and post-2022 beets. Graduate student attended field day to discuss project with cooperators and other growers. Graduate student has developed protocols for field experiments. Construction of dust collectors at UMN shop for wind erosion monitoring post-2022 beetsis nearly complete.

Activity 2
We have recruited 1 farmer to seed cover crops after 2022 wheat prior to 2023 beets, and post-2022 beets. We visited 2 farmers and contacted 5-10 other farmers but more than 1 would not agree to participate. Collaborators have discussed a survey approach, as many growers in NW MN are using cover crops prior to beets, but are not willing to install replicated field trials. We plan to work with American Crystal Sugar Beet Agronomists to collect data about management practices and beet success in both cover cropped and non-cover cropped fields to present to growers, highlighting the (expected minimal) risk to beet yield after cover crops. Graduate student has developed protocols for field experiments. Construction of dust collectors at UMN shop for wind erosion monitoring post-2022 beets is nearly complete.

Dissemination
Team members from UMN Extension, American Crystal, West Polk Soil and Water Conservation District and the MN Wheat Growers On-Farm Research Network assisted in looking for growers to participate in the study in NW MN. Although none were found, West Polk SWCD held several meetings inside and in the field discussing the application of strip-till and cover crops in sugar beet systems, bringing growers and researchers together.

Status Update Reporting

Status Update April 1, 2022

Date Submitted: April 1, 2022

Date Approved: April 1, 2022

Overall Update
Working with partners at the West Polk SWCD, the project has brought together sugarbeet growers in the Crookston, MN, area, who are working with strip-till. Several of these growers will participate in on-farm research trials; more importantly they are considering ways to implement strip-till with cover crops and beets, and learning from each other.

Activity 1
A graduate student for the project began Jan 2022. We have visited two growers in central MN who are willing to participate in the trial, learning about how they use cover crops in rotation with beets now. This helps us to plan relevant research that will be easy for the farmers to implement, increasing chances of success.

Activity 2
A graduate student for the project began Jan 2022. We have held two meetings with growers, American Crystal Sugar agronimsts, and West Polk SWCD staff, to discuss the on-farm trials. Getting equipment for the trial is a challenge, and these conversations have built trust and engagement with the growers, so that they are willing to participate and use their equipment for the research. In addition, we have developed a Roles and Responsibilities document for the NWROC trial, sourced equipment for strip-tilling and interseeding on 22" rows, and reserved plot space beginning fall 2022.

Dissemination
By attending and speaking with others at the Sugarbeet Research meeting in Fargo in January, Cates, DeJong-Hughes, Peters, and Pease are building awareness of their research among growers and companies. The company agronomists are critical for grower adoption, and so continuing to build relationships and discuss issue with those people is important to the project.