

**Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 218-F

Developing Cover Crop Systems for Sugarbeet Production

Category: F. Methods to Protect, Restore, and Enhance Land, Water, and Habitat

Sub-Category:

Total Project Budget: \$ 300,546

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

Summary:

Cover crops in sugarbeet production can reduce erosion and nutrient loss from agroecosystems in West-Central and Northwest Minnesota. Developing agronomic guidelines will support growers adopting sustainable practices.

Name: Anna Cates

Sponsoring Organization: U of MN

Job Title: Dr

Department: Department of Soil, Water, and Climate

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Location:

Region: Central, Northwest

County Name: Becker, Big Stone, Chippewa, Clay, Douglas, Grant, Kandiyohi, Kittson, Lac qui Parle, Lyon, Mahnomon, Marshall, Norman, Otter Tail, Polk, Red Lake, Renville, Stevens, Swift, Traverse, Wilkin

City / Township:

Alternate Text for Visual:

Cover crops hold soil in place, retain N and P, and add organic matter to the soil. Without cover crops, erosion transports N and P to waterways and leaves degraded soil.

<input type="checkbox"/>	Funding Priorities	<input type="checkbox"/>	Multiple Benefits	<input type="checkbox"/>	Outcomes	<input type="checkbox"/>	Knowledge Base	
<input type="checkbox"/>	Extent of Impact	<input type="checkbox"/>	Innovation	<input type="checkbox"/>	Scientific/Tech Basis	<input type="checkbox"/>	Urgency	
<input type="checkbox"/>	Capacity Readiness	<input type="checkbox"/>	Leverage	<input type="checkbox"/>		TOTAL	<input type="checkbox"/>	%



PROJECT TITLE: Developing Cover Crop Systems for Sugarbeet Production

I. PROJECT STATEMENT

This project will address a threat to water quality in western Minnesota by developing soil health management systems for sugarbeet production, focusing on successful integration of cover cropping to reduce erosion, nutrient leaching, and weed pressure. Sugarbeet production leaves soils vulnerable to erosion, nutrient loss, and slow degradation of soil health. To address these concerns, we'll investigate cover crops both before and after beets in regionally-specific crop rotations.

- 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. This presents 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. Working with the Southern Minnesota Beet Sugar Cooperative (SMBSC), Minn-Dak Farmers Cooperative, and American Crystal Sugar (ACS) agronomists and producers, we will establish large-scale on-farm trials and plot-scale trials at the University of Minnesota Northwest Research and Outreach Center (NWROC) in Crookston, MN. We will 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.

II. PROJECT ACTIVITIES AND OUTCOMES

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

Description: We will evaluate three treatments for soil protection and agronomic best practices: (1) pre-beet cover crops, (2) post-beet cover crops, and (3) both pre- and post-beet cover (corn-cover-beet-cover rotation). Building on SMBSC research on interseeding brassica, legume and grass cover crops into standing sugarbeets and UMN-Extension evaluations of strip-till corn to sugarbeets, we will establish large replicated on-farm strip trials of a variety of cover crop species, seeding and termination timing. Minn-Dak and SMBSC will assist in identifying grower cooperators and managing the plots. We will use dust collectors to quantify soil and nutrients lost to wind erosion and measure soil health metrics (biologically active soil C and N). Field days will be held each year to address grower concerns and share best management practices developed.

ENRTF BUDGET: \$68,404

Table with 2 columns: Outcome, Completion Date. Row 1: 1. Select on-farm research sites, interseed cover into V4-V6 corn, and evaluate fall erosion; Fall 2020. Row 2: 2. Evaluate cover establishment, spring erosion, and sugarbeet production; Summer-fall 2021 and 2022.



3. 2 field days to disseminate results	Fall 2021, fall 2022
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Activity 2: Northwest Minnesota: Integrating cover crops in wheat-sugarbeet rotations

Description: 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). In order to evaluate surface runoff, we will compare pre-beet cover, post-beet cover, and both (wheat-cover-beet-cover rotation) in large plots at the UMN NWROC, monitoring for cover crop success, weed pressure, wind erosion, nutrient loss, and surface runoff as well as sugarbeet yield and quality, disease pressure, and soil health metrics. American Crystal Sugar will help to identify farmer cooperators for on-farm trials where all metrics except surface runoff will be monitored in the same manner.

ENRTF BUDGET: \$232,142

Outcome	Completion Date
1. Establish cover crops in wheat at Crookston and on-farm sites	Summer 2020 and 2021
2. Evaluate cover establishment, spring erosion, and sugarbeet weed pressure, production.	Summer 2021 and 2022
3. 3 field days to disseminate results	Fall 2021 and 2022

III. PROJECT PARTNERS AND COLLABORATORS:

No ENRTF funding required: The UMN Extension Northwest Regional Sustainable Development Partnership will assist with outreach activities associated with this project, including grower workshops and fact sheet distribution. Dr. Thomas Peters, Extension Sugarbeet Agronomist, North Dakota State University and University of Minnesota will lead weed pressure evaluation. Staff at the West Polk Soil & Water Conservation District, MN Wheat, SMBSC, Minn-Dak, and ACS will assist in identifying growers for on-farm research.

ENRTF funding required: **Dr. Lindsay Pease**, 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. **Ms. Jodi DeJong-Hughes**, Regional Extension Educator in Crops and Soils, UMN, lead on Central MN work. **Mr. Dorian Gatchell**, MN Ag Services Consultant. **Sugarbeet farmers**, to be identified. **Graduate Research Assistant**, UMN, field sampling and analysis. **Mr. Jeff Nielson**, NWROC Field Technician, manage NWROC Field Plots. **Mrs. Heidi Reitmeier**, NWROC Lab Technician, collect and process soil, water, and plant samples.

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

This project addresses basic questions of cover crop management for sugarbeet growers; however, we expect to continue to refine these systems. Cates, Peters, Pease, and DeJong-Hughes will disseminate these results through field days on farms, at the NWROC Crop and Soils Field Day, UMN-Extension website, and two peer-reviewed research publications. Peters will share results at winter Grower’s Seminars and ACS’s “Way to Grow” series. Federal, state and local cost-share is available to individual growers for cover cropping. Commodity crop research organizations including the Sugarbeet Research and Education Board, MN Wheat, MN Soybean Growers Association, and MN Corn Growers Association all offer cover crop research funding which may be used to delve deeper into questions raised by this study.

Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet



Legal Citation:
 Project Manager:
 Project Title:
 Organization:
 Project Budget:
 Project Length and Completion Date:
 Today's Date:

Dr. Anna M. Cates
 Developing Cover Crop Systems for Sugarbeet Production
 University of Minnesota- MN Office for Soil Health
 \$ 300,546.00
 7/1/2020- 12/31/2022
 3/15/2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits) (for 2.5 years)		\$ 205,904	\$ -	\$ 205,904
Dr Anna Cates, Soil health specialist, Project Director, (10%) \$21,167 salary + Fringe (36%) \$7,620, Total \$28,787				
Dr Lindsay Pease, Extension specialist, (5%) \$11,597 salary + Fringe (36%) \$4,174, Total \$15,771				
Jodi DeJong-Huges, Extension Educator (2.5%) \$4,990 salary + Fringe (36%) \$1,797, Total \$6,787				
Jeff Nielsen, NWROC Field Technician, (5%) \$6,766 salary + Fringe (29.5%) \$1,996, Total \$8,762				
Heidi Reitmeier, NWROC Lab Technician, (10%) \$10,717 salary + Fringe (29.5%) \$3,162, Total \$13,879				
TBD, Cates Research Technician, (10%) \$10,571 salary + Fringe (29.5%) \$3,118, Total \$13,689				
Graduate Research Assistant, (50%) \$64,099 + Fringe (16.1% + Tuition) \$54,130, Total \$118,229				
Professional/Technical/Service Contracts		\$ 2,400	\$ -	\$ 2,400
Soil sampling, sensor installation (Activity 1) by consultant \$20/hr * 60 hrs/year				
Equipment/Tools/Supplies		\$ 51,400	\$ -	\$ 51,400
Manufacture dust collectors (\$50/each * 36 in Activity 1, 100 in Activity 2), Total \$6,800				
Manufacture surface runoff collectors (\$200/each * 144), Total \$28,800				
Cover crop seed, \$3,000				
Crookston Experiment Station land use fee, \$1,500				
On-farm land rent, \$9,000				
Equipment rental (strip-tiller and cover crop inter-seeder, Activity 1 only), \$1,800				
Soil sampling equipment \$500				
		\$ -	\$ -	\$ -
Capital Expenditures Over \$5,000		\$ -	\$ -	\$ -
Fee Title Acquisition		\$ -	\$ -	\$ -
Easement Acquisition		\$ -	\$ -	\$ -
Professional Services for Acquisition		\$ -	\$ -	\$ -
Printing		\$ 300	\$ -	\$ 300
Distribution of fliers advertising field days, fact sheets of results, \$300				
Travel expenses in Minnesota - in accordance with UMN Travel Policy		\$ 15,622	\$ -	\$ 15,622
Approximately 46 trips/year for field days, sampling and project team meetings at \$.58/mile + lodging (\$1000) + M&IE (\$700), Total \$14,122				
Present results at beet growers meeting, \$1,500				
Other		\$ 24,920	\$ -	\$ 24,920
Water Sample Analysis (8 samples/yr* \$5/sample * 16/field * 4 fields * 2 yrs), Total \$5,120				
Soil Sample Analysis (\$50/sample * 24 plots/site * 7 sites * 2 yrs), Total \$16,800				
Field day logistics (food, travel, porta-potty) \$500/each for 5 field days, Total \$2,500				
Publication costs (2 peer-reviewed publications @ \$250/each), Total \$500				
COLUMN TOTAL		\$ 300,546	\$ -	\$ 300,546
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:		\$ -	\$ -	\$ -
State:		\$ -	\$ -	\$ -
In kind: Agronomic consultation and support from SMBSC, Minn-Dak and ACS	pending	\$ -	\$ -	\$ -
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
		\$ -	\$ -	\$ -

Cover crops hold soil in place, retain N and P, and add organic matter to the soil.



Without cover crops, erosion transports N and P to waterways and leaves degraded soil.



**Environment and Natural Resources Trust Fund (ENRTF)
2020 Project Manager Qualifications and Organization Description**

PROJECT TITLE: Developing Cover Crop Systems for Sugarbeet Production

Project Manager Qualifications and Organization Description

Dr. Anna M. Cates, Project PI, Assistant Professor and Extension Specialist, Minnesota Office for Soil Health and Department of Soil, Water, and Climate. The Minnesota Office for Soil Health (MOSH, <https://www.wrc.umn.edu/mosh>), of which Dr. Cates is the principal member, was founded in 2018 to address water quality in Minnesota's agricultural lands by focusing attention on soil stewardship. Dr. Cates is involved with technical training for local government personnel including Soil and Water Conservation Districts and NRCS staff to increase support for farmers in implementing conservation practices across the state. The MOSH is putting together a Minnesota Cover Crop Guide in 2019 which will compile research on cover crops in the state to make recommendations and identify research needs in this burgeoning area. Dr. Cates has experience managing budgets and personnel in both academic and private settings. She has published in peer-reviewed journals on cover crops and crop management impacts on soil organic matter pools and soil structure.

Dr. Lindsay A. Pease, co-PI, Assistant Professor and Extension Specialist in Nutrient and Water Management, Northwest Research & Outreach Center and Department of Soil, Water, and Climate. Dr. Pease is the newest faculty member at the University of Minnesota Northwest Research & Outreach Center in Crookston, MN. The goal of Dr. Pease's research and outreach programming is to develop nutrient and water management strategies that improve agricultural productivity, profitability, and sustainability through smarter management of fertilizer and water. She aims work alongside growers to develop practical management solutions for the unique soils, cropping systems, and climate of Northwest Minnesota. She has ten years of research experience in soil and water management, and she has been an author or co-author on eight peer-reviewed publications exploring the connection between agricultural management and edge-of-field nutrient loss.

Jodi DeJong-Hughes, co-PI, has been a Regional Educator with the University of Minnesota Extension for over 22 years. Her area of specialization includes reduced tillage management, soil compaction, and improving soil health. Jodi's work focuses on reducing soil erosion to improve the grower's bottom line and to reduce the movement of soil and nutrients to our natural waterways. Jodi enjoys working alongside growers, ag industry, and government agencies to bring high-quality, educational programs and research to the people of Minnesota.

The Water Resources Center (WRC, wrc.umn.edu) houses MOSH, and is itself part of both the College of Food, Agriculture, and Natural Resources Sciences and University of Minnesota Extension. This center provides education and outreach on water issues for private citizens and students at UMN.

The Northwest Research and Outreach Center (NWROC) is one of ten unique Research and Outreach Centers (ROCs) located in communities throughout Minnesota. The University's ROCs are affiliated with the College of Food, Agricultural and Natural Resource Sciences and represent the College and University's mission to respond to the needs of all Minnesotans. NWROC serves the prairie and adjacent land area of northwestern Minnesota. The center provides analytical, biological, and field laboratories to University of Minnesota faculty, staff, and students to conduct research and demonstrations that will enhance the efficient use of agriculture and natural resources in northwest Minnesota.

The University of Minnesota (UMN, umn.edu) houses all research personnel. It is the flagship institution in the state for agricultural research and has a thriving Extension program, with deep expertise in disseminating research to the agricultural community.