

**Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 076-B

Farm-Ready Cover Crops for Protecting Water Quality

Category: B. Water Resources

Sub-Category:

Total Project Budget: \$ 741,184

Proposed Project Time Period for the Funding Requested: June 30, 2022 (3 yrs)

Summary:

We will implement an economically-viable, farm-based strategy to protect water quality across more than 100,000 acres of vulnerable wellhead protection regions using cover crops in corn-soybean rotation.

Name: Keith Olander

Sponsoring Organization: Central Lakes College - Ag and Energy Center

Title: Director

Department: Central Lakes College

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Location

Region: Central, Metro, Northwest, Southwest, Southeast

County Name: Statewide

City / Township:

Alternate Text for Visual:

We will lead a farm-based approach to adopt camelina and kura clover cover crops in corn-soybean rotation to provide continuous green cover protecting erodible soils and groundwater from nitrate contamination.

<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"/> %
<input type="checkbox"/> If under \$200,000, waive presentation?							



PROJECT TITLE: Farm-Ready Cover Crops for Protecting Water Quality

I. PROJECT STATEMENT

Protecting water quality and supporting economically viable agriculture is fundamentally important to Minnesota. We will lead a farm-based effort to adopt kura clover and camelina cover crops into corn-soybean rotation to protect vulnerable wellhead areas from nitrate contamination. These cover crops fit within corn-soybean rotations, distinguishing them from other LCCMR-recommended programs that rely on perennial crops such as Kernza® and alfalfa for wellhead protection. More importantly, our small-plot research show these cover crops can reduce nitrate leaching by over 70%. Seven working farms across Todd, Otter Tail, Dakota, and Stearns Counties will support a farm-community demonstration and research effort aimed at increasing cover crop adoption statewide including the 100,000+ acres of row crops on highly vulnerable wellheads. Leveraging economic advantages of cover crops will incentivize and drive adoption by farmers, e.g. kura clover can supply a majority of corn N demand, reducing or eliminating external nitrogen application while building organic matter and protecting soil; Camelina oilseed crops are poised to provide a new annual revenue stream. Despite the benefits of these cover crops for water quality and agriculture, barriers must be overcome to realize economically-driven protection of wellhead areas. We address these barriers in this proposal:

- 1) Field-scale reduction in nitrate contamination: Do cover crops provide same or greater nitrate reductions as other practices such as best management practices at the field scale?
2) Market development: Commercial markets are lacking for camelina but critical to farmer adoption.
3) Education: Outreach programs demonstrating benefits of continuous living cover to farmers and other land managers need to be expanded for greater adoption across the state.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Field-scale test of water quality protection from cover crops in corn-soybean rotation

Over 70% of the nitrate contamination originates from farm runoff and leaching. On each of four working farms we will establish field-scale research plots (each 5 acres) comparing nitrate reductions from: 1) Perennial kura clover groundcover in corn-soybean rotation, 2) fall-seeded/ spring harvested camelina oilseed in corn-soybean, and 3) Conventional corn-soybean with best nitrogen management. Agronomics (e.g. yields, nitrogen inputs) will be measured to compare economic inputs and returns from conventional practices and cover crops. Using hydrologic field data we will build crop-hydrological models illustrating tradeoffs between yield, farm economics, and nitrate contamination to inform agricultural policy on water protection.

ENRTF BUDGET: \$511,000

Table with 2 columns: Outcome, Completion Date. Row 1: Field-scale test efficacy of cover crops to mitigate nitrate, phosphorus and sediment contamination, October 1, 2022. Row 2: Enterprise budget showing farmers how to maximize economic benefits of cover crops, October 1, 2022. Row 3: Crop-hydrologic model illuminating guidance for mitigating nitrate pollution from corn-soybean rotation, December 1, 2022.

Activity 2: Develop and bring to market new products from camelina to spur producer adoption of cover crops

This activity will establish new and viable supply chains from farm to market for camelina-based food, biofuel, and bioproducts serving as an economic driver to promote farmer adoption of camelina. We will develop a detailed analysis of oil and seed meal to support applications in food, cosmetics, biofuel, bioproducts, and livestock feed. We will engage private businesses in developing pilot-scale projects demonstrating the pressing, refinement and marketing of oilseeds. Finally, commercial application and supply-chain development information will be presented to farmers and businesses through 3 – 6 AURI Innovation Network program forums, as well as one-on-one networking and meetings.



**Environment and Natural Resources Trust Fund (ENRTF)
2019 Main Proposal Template**

ENRTF BUDGET: \$121,000

Outcomes supporting farmer adoption of camelina	Completion Date
1. <i>Commercial application development of camelina seed meal and oil</i>	<i>October 1, 2020</i>
2. <i>Supply chain development for farmers, commodity groups, and co-ops</i>	<i>October 1, 2020</i>
3. <i>Stimulate demand among supply chain partners (e.g. processors, distributors)</i>	<i>October 1, 2021</i>

Activity 3: Farm-based outreach program supporting adoption of water quality-protecting cover crops

Cropping systems will be demonstrated on 90 acres across seven working farms in Todd, Otter Tail, Dakota, and Stearns counties including “high” or “very high risk” Minnesota wellhead protection acres. Our farmer-led outreach effort will cultivate “Champion farmers” who will grow continuous living cover and co-present in field day events to provide first-hand demonstrations of oilseed production, in-field nitrogen management efficiency, cash crop production capacity, and market opportunities for camelina-based products. Working with SWCDs in each county, farmers in our program will leverage federal cost-share funds (e.g. Conservation Stewardship Program) to support cover crop adoption on wellhead protection areas. Through winter grower meetings, a series of web-based educational publications, and more we will engage farmers and conservation organizations with educational curriculum and field demonstrations outlining the wellhead protection services and economic advantages of continuous living cover that protect water quality.

ENRTF BUDGET: \$109,000

Outcome	Completion Date
1. <i>Implement outreach program (on-farm tours, workshops, and field days) to increase cover crop adoption across the 100,000+ acres of row crops on highly vulnerable wellhead protection areas</i>	<i>December 2022</i>
2. <i>Develop publications supporting state-level guidance on implementation and impacts of continuous living cover farming to mitigate nitrate contamination of groundwater</i>	<i>December 2022</i>

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

University of Minnesota: Drs. Jim Eckberg and Scott Wells will lead research of cover crops (Act. 1).

Agricultural Utilization Research Institute: Dr. Goutham Vemuri will lead commercialization of camelina (Act. 2).

USDA-Agricultural Research Service: Dr. Sharon Weyers will provide sample processing only, no salary (Act. 1).

B. Partners not receiving ENRTF funding

Minnesota Department of Agriculture: Mr. Ryan Perish will provide guidance on hydrological monitoring (Act. 1).

Dakota and Stearns Counties Soil & Water Conservation Districts: Support farmer recruitment and identification of vulnerable wellhead protection areas.

IV. LONG-TERM- IMPLEMENTATION AND FUNDING:

This project is designed to test and demonstrate economically driven conservation farming practices for reducing nitrate contamination supporting future expansion of continuous living cover beyond the four county area targeted in this proposal. We will seek future funding from grants and organizations such as the USDA Conservation Innovation Grant and Corn Growers Association to test nitrate reduction, agronomic productivity, and soil health dynamics from long-term (3+ years) implementation of continuous living cover systems.

V. TIME LINE REQUIREMENTS:

The project is designed to complete Activity 2 in two years. Field testing kura clover (Activity 1) requires three complete field seasons which includes a year to establish kura clover in soybeans. We therefore request a three year budget to complete this project. Outreach Activity 3 will occur in tandem with the field testing Activity 1.

2019 Proposal Budget Spreadsheet

Project Title: Farm-Ready Cover Crops for Protecting Water Quality

IV. TOTAL ENRTF REQUEST BUDGET 3 years

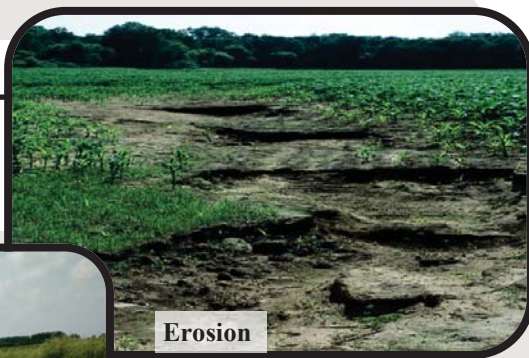
BUDGET ITEM	AMOUNT
Personnel:	\$ -
Activity 1: Team will field-scale test cover crops, and coordinate collection of data. Our team includes each personnel: Farm Manager- Plot Establishment and Maintenance- 0.17 FTE/ yr x 3 yrs (\$33,825 total salary + \$10,012 total benefits); Research Coordinator - Coordinate Data Collection and Instrumentation - 0.41 FTE/ yr x 3 yrs (\$59,121 total salary + \$17,499 total benefits); Undergraduate labor - field and laboratory data collection - 0.25 FTE / yr x 3 yrs (\$18720 total salary + \$0 benefits)	\$ 139,177
Activity 3: Outreach team will implement a series of grower meetings, web-based educational publications, on-farm field days and workshops in each of the 4 target counties (Otter Tail, Stearns, Todd, and Dakota) aimed at increasing cover crop adoption acres 100,000+ acres of vulnerable wellhead protection areas including 16 total extension events and 3 extension publications. Outreach Coordinator- Farmer relations, recruitment, and lead educational curriculum development- 0.11 FTE / yr x 3 yrs (\$47,238 total salary + \$13,983 total benefits); Event and Publications Coordinator - Develop educational curriculum, extension materials, and publications- 0.08 FTE/ yr x 3 yrs (\$13,486 total salary + \$3,992 total benefits)	\$ 78,699
Professional/Technical/Service Contracts:	\$ -
University of Minnesota	\$ 150,284
Activity 1: Team will develop enterprise budget of agronomic inputs/returns, build crop-hydrological model and develop peer-reviewed publication. Agronomy Research Scientist - Data analysis, enterprise budgets, and synthesis of peer-reviewed publication - 0.27 FTE/ yr x 3 yrs (\$60,750 total salary + \$20,351 total benefits); Agronomy faculty- Data analysis, enterprise budgets, and synthesis of peer-reviewed publication - 0.14 FTE/ yr x 3 yrs (\$37,800 total salary + \$12,663 total benefits); Undergraduate labor - field and laboratory data collection - 0.25 FTE / yr x 3 yrs (\$18,720 total salary + \$0 benefits)	
University of Minnesota	\$ 27,034
Activity 3: Event and Publications Coordinator- Responsible for development of educational curriculum, extension material and publications - 0.09 FTE/ yr x 3 yrs (\$20,250 total salary + \$6784 total benefits)	
Agricultural Research Service - USDA	\$ 172,320
Activity 1: Water & soil sampling occurs after plot establish in years 2-3 Water and soil sample processing and instrumentation. 9 lysimeter sampling locations / farm-field plot x 2 sampling depths x 12 farm-field plots = 216 lysimeters @ \$80 each (\$17,280); Sample water in each lysimeter every 3 wks, 12 samples / lysimeter/ yr = 2592 samples / yr x 2 yrs = 5184 total water samples @ \$10/ sample for solution filtration and nitrogen analysis (\$51,840); Sample soil at 3 depths x 108 lysimeter sampling locations x 2 sampling periods each yr x 2 yrs = 1,296 samples for total Carbon, Nitrogen \$10/sample (\$12,960), Inorganic Nitrogen \$5/ sample (\$6,480), Phosphorus \$5/ sample (\$6,480); 1 weir for estimating overland nitrogen and sediment loss / farm-field plot x 12 farm-field plots = 12 weirs @ \$5,000 each for construction and installation (\$60,000); 36 sampling events / 12 weirs/ yr x 2 yrs = 864 total water samples of water Nitrogen \$10/ sample (\$8640) and water/sediment Phosphorus \$10/ sample (\$8640)	
Agricultural Utilization Research Institute	\$ 112,000
Activity 2: The project commercialization (supply chain and value-add) team will map, develop and report on Camelina seed processing and application in food and bioproducts development. Project Manager - 0.45 FTE/yr x 2 yrs (\$80,000 total salary + \$23,000 total benefits). Camelina market research and technical services for seed cleaning and food-grade oil extraction (\$6,000). Organizing targeted forums, dissemination and outreach activities (\$3,000)	
Participating "Champion" Farmers:	\$ 27,000
Activities 1 & 3: Participating farmers will be compensated for use of farmland at market rates. Land rent for 90 total acres @ \$100/acre/year x 3 yrs (\$27,000)	
Equipment/Tools/Supplies:	\$ -
Baker Tillage System equipment use \$2000/ yr x 2 yrs (\$4,000); Interseeding, spraying and harvesting equipment \$1000/ yr x 3 yrs (\$3000); Herbicides \$5/ acre/ yr x 3 yrs x 90 acres (\$1350); 10 lbs Kura clover/ acre x 35 acres x \$8/lb (\$2800) and 8 lbs camelina/ acre x 35 acres x \$3/ lb x 3 years (\$2520)	\$ 13,670
Travel:	\$ -
Activity 1 travel for establishment of experimental plots, instrumentation, sample collection by Central Lakes College Ag Center - 12 trips to research plots per year @ \$250/ trip including mileage & per diem x 3 yrs (\$9000)	\$ 9,000
Activity 2 travel to participating in business, grower meetings, and end-users- 9 trips / yr @ \$500/ trip including mileage & per diem x 2 years (\$9,000)	\$ 9,000
Activity 3 Outreach team will travel to grower meetings, field days- 4 trips / yr @ \$250/ trip including mileage and per diem x 3 years (\$3000)	\$ 3,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 741,184

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period: USDA- ARS Dr. Sharon Weyers 0.05 FTE / yr x 2 years (\$9,887 total salary + \$2,966 total benefits)	\$ 12,853	Secured
Other State \$ To Be Applied To Project During Project Period:	\$ -	NA
In-kind Services To Be Applied To Project During Project Period:	\$ -	NA
Past and Current ENRTF Appropriation:	\$ -	NA
Other Funding History:	\$ -	NA

Corn-Soybean Rotations

- Lack cover late fall to spring
- Risk of erosion



Erosion



Waterways

Cover Crops in Corn-Soybean Rotations

- Protect and build soil
- Mitigate nitrate leaching
- Marketable camelina oil production



Camelina

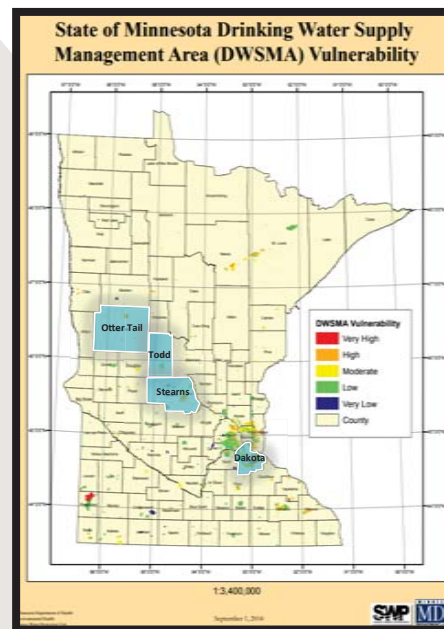


Kura Clover



Oilseed Production

Farm-Ready Cover Crops for Protecting Water Quality



Monitor Cover Crops and Water Quality

- Field-scale monitoring
- Target counties with vulnerable wellhead protection regions and erodible soils



Lysimeters



Soil Erosion Monitoring



***Project Manager:
Keith Olander***

Dean of Agricultural Studies, Central Lakes College
Supervise 13 faculty in Agriculture, Food, & Natural Resources Education

Director of AgCentric, Minnesota State Center of Excellence in Agriculture
Coordinate Professional Development of Statewide Farm Business Management
Facilitate Database Construction, over 2100 farms
Eight Colleges within Minnesota State, 66 faculty

Director of Central Lakes College Ag & Energy Center, Central Lakes College
Facilitate over 40 public & private research partnerships
1800 acre research & demonstration in the following areas:

- Alternative Energy
- Cover Crops
- Soil Water Quality
- Irrigation Technology Management
- Local Foods Systems Catalyst
- Agronomic Crop Production

Owner & Operator, crop farm

350 acres of row crops – 30 year practitioner, rural Staples, MN

Demonstrating balance in environmental impact with financial sustainability

**As a practitioner, a large amount of credibility is extended when presenting to local farmers as they give credence to listening to “another farmer”.

Organization Description:

The Ag and Energy Center is a catalyst for agriculture research and demonstration in the coarse, sandy plains of Minnesota. The **mission** of the Central Lakes College Ag and Energy Center is to build futures; as it delivers valuable products, services, and education, which contribute to the economic vitality of the region.

The Ag and Energy Center has built a network of farmers and agricultural partners in the region. The Center is guided by an advisory council that includes area farmers and will provide expertise on increasing the adoption of cover crops by the farm community. Leading teams to meet grant and research objectives is integral to the mission of serving our region’s farmers. Aside from involving farmers in guiding farm demonstration, the Ag & Energy Center Director is the education liaison for local farm groups offering annual programming with an emphasis in water quality, monitoring, and “forever green” concepts like cover crops. These relationships make the Ag & Energy Center uniquely positioned to effectively lead the effort to increase cover crop adoption on the central sandplains.

