



Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-384

Proposal Title: Long-term Nitrate Mitigation by Maintaining Profitable Kernza Production

Project Manager Information

Name: Dennis Fuchs

Organization: Stearns County Soil and Water Conservation District

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Project Basic Information

Project Summary: Long-term nitrate mitigation by maintaining profitable Kernza production will evaluate the effectiveness of aging Kernza stands on water quality. Continue to develop a sustainable supply chain, focusing on post-harvest processing.

Funds Requested: \$571,000

Proposed Project Completion: 2024-06-30

LCCMR Funding Category: Water Resources (B)

Project Location

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

Region(s): Central

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

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

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

Nitrate leaching from crop fields to groundwater pollutes natural habitats and threatens human health. A new perennial grain crop called Kernza® can reduce nitrate leaching and provide other ecosystem services such as carbon sequestration, wildlife habitat, and soil conservation, all while keeping farmland in production. However, Kernza grain yields decline in the 3rd year, reducing profitability. This project will continue monitoring existing LCCMR Kernza plantings and determine how yields can be maintained while still preventing nitrate leaching.

This opportunity is critical for two reasons: 1) It is very rare to be able to monitor water quality in a novel crop like Kernza for more than three years, and this project would provide the first long-term dataset of its kind in the world. 2) Markets and supply chains for Kernza are emerging in Minnesota faster than anywhere in the USA, thus our state is poised to show our country how a perennial crop that protects drinking water can also improve the agricultural economy. This project would both contribute to and take advantage of the emerging Kernza market.

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

The State of Minnesota has a rare and valuable opportunity to enhance the protection of drinking water and the environment for citizens. A previous LCCMR grant (details below) successfully established and instrumented three Kernza fields – one in a replicated experiment in Pope County and two in large-scale research and demonstration fields in Stearns County – both areas with elevated groundwater nitrate levels. It has also developed Kernza product specifications and processing procedures to ensure that grain harvested from these fields can be safely and economically incorporated into various food and beverage products to stimulate local economies. The previous project is set to end on June 30, 2021, and this project would extend monitoring and commercialization activities for years 2021 – 2024.

Specifically, this project will measure nitrate leaching below aging Kernza stands (years 3-5), test different methods of stimulating grain yields in aging stands, and determine the effects of those methods on water quality. This project will also continue to research and develop sustainable supply chains with an emphasis on post-harvest handling and processing optimization for various food and non-food products. Results will be disseminated to a wide range of stakeholders through extensive outreach events and networks.

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?

Minnesota's current agriculture is dominated by annual crops like corn and soybean that grow during the summer, leaving land bare and brown for much of the year. Without active plant root systems to hold soil in place and absorb water, fields are much more vulnerable to wind and water erosion, and nutrient leaching; both major contributors to non-point source pollution. By adding perennial, like Kernza, improvements to water quality, such as drinking water, can be achieved because these crops are active during most of the year, including the fall, winter and spring when summer annual crops are absent.

Activities and Milestones

Activity 1: Identify stand renovation methods to increase nitrate leaching mitigation and grain yield in ageing Kernza stands.

Activity Budget: \$264,000

Activity Description:

Continue monitoring existing Kernza research plots as they age at the Rosholt Research Farm using lysimeters and soil water sensors to measure water quality and nitrate leaching in years 3-5. Tasks include collecting soil water samples from lysimeters every two weeks during three growing seasons, 2021, 2022 and 2023, analyzing nitrate concentration in all soil water samples, measuring soil moisture at various depths every three weeks, applying irrigation to half of the plots, monitoring soil conditions, and measuring biomass and grain yields annually.

We will impose two yield renovation treatments in year four (year two of this project) to established Kernza stands managed with and without irrigation at the Rosholt Research Farm and the on-farm production fields. The two renovation treatments will include one organic option using strip tillage and one conventional option using herbicides. Both treatments will strive to terminate 8" wide strips while maintaining 24" wide rows of Kernza. Based on preliminary data, the tillage treatments will be imposed in the fall and the herbicide treatments will be imposed in the spring. These treatments will be applied as a split-plot factor to the existing experiment at Rosholt and as a completely randomized block design at one on-farm location.

Activity Milestones:

Description	Completion Date
Recommend practices to enhance mitigation of nitrate leaching and Kernza yields in ageing stands	2024-06-30
Report changes in nitrate leaching and yields beneath Kernza over a 5-year production system.	2024-06-30

Activity 2: Build sustainable supply chains, enhance utilization, and assess storage and handling techniques for Kernza

Activity Budget: \$200,000

Activity Description:

Work on this activity will support the development of sustainable supply chains for Kernza® through technical assistance, commercialization, and stakeholder engagement. Technical work is focused on the evaluation of post-harvest handling, cleaning, drying, and storage of Kernza®. Tests will be conducted to evaluate the effectiveness of different grain drying technologies. We will select conditions and technologies that will result in minimal grain damage from harvest while maximizing yield and quality. We will also assess the optimal harvest and storage conditions (moisture, drying temperature, duration) to enable effective on-farm storage of Kernza® grain, providing recommended technologies and process operating conditions. Supply chain development efforts will be aimed at expanding uses and markets for Kernza®, with a special focus on the advancement of ecosystems services models that will provide additional economic returns to growers and increase market viability. AURI staff will also work with Minnesota businesses on pilot projects to test and demonstrate market-ready Kernza® food and non-food products. AURI's outreach component will include organizing an annual field day and inclusion of Kernza®-related programming at annual AURI "Fields of Innovation" events to further awareness, knowledge-sharing, and action planning and build stronger commercialization and supply chain networks for Kernza®.

Activity Milestones:

Description	Completion Date
Identify and evaluate methods for post-harvest handling, cleaning, drying, and storage of Kernza®.	2023-09-30
Provide technical assistance to Minnesota businesses developing Kernza®-based products and processing capacity	2023-12-31
Disseminate information developed during project through events, publications, and other outreach activities.	2024-06-30
Support grower profitability and sustainability through ecosystem services markets and continued supply chain development.	2024-06-30

Activity 3: Support local grower adoption of Kernza production through outreach and networking

Activity Budget: \$107,000

Activity Description:

Technical support will be provided to growers in the Cold Spring watershed to plant additional Kernza acreage to provide perennial cover in sensitive drinking water source management areas (DWSMAs) in the region with the intent to prevent nitrate leaching to groundwater and bolster local economies. Results from activities 1 and 2 will be disseminated to various stakeholders including growers, concerned citizens, agencies, non-profits, businesses, and others working to protect Minnesota drinking water. A special session on Kernza production and water quality will be held at the annual Rosholt summer field day, which attracted 100 participants in 2019. Dissemination and outreach will also occur through other activities supported by Pope and Stearns County SWCDs, including events focused on drinking water quality.

Activity Milestones:

Description	Completion Date
Share information developed during project through events, publications, and other outreach activities.	2024-06-30
Support growers by providing technical assistance on Kernza production	2024-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Michael Stutelberg	Agricultural Utilization Research Institute	Lead supply chain activities	Yes
Holly Kovarik	Pope County Soil and Water Conservation District	Manage Rosholt research plots	Yes
Margaret Wagner	Minnesota Department of Agriculture	Oversee deliverables on water quality	No
Jacob Jungers	University of Minnesota	Lead Kernza research	Yes

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 be funded?

This work is part of the Forever Green Initiative, a coordinated effort to develop the next generation of perennial crops to protect Minnesota’s environmental resources. Clean Water Funds allocated to the Forever Green Initiative are used for the basic research needed to develop new crops. LCCMR funds are crucial for studying the environmental aspects of these new crops and supporting field-scale deployment of new crops – which we have demonstrated from previous LCCMR appropriations below. LCCMR funds help Minnesota citizens realize the environmental and economic benefits of new Forever Green crops. Related projects are supported by federal grants and industry.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Accelerating Perennial Crop Production to Prevent Nitrate Leaching	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04k	\$440,000

Project Manager and Organization Qualifications

Project Manager Name: Dennis Fuchs

Job Title: Administrator

Provide description of the project manager’s qualifications to manage the proposed project.

Dennis Fuchs has been the administrator of the award-winning STEARNS COUNTY SOIL AND WATER CONSERVATION DISTRICT since 1996. Dennis leads a team of 19 dedicated staff with a mission to provide local leadership in the conservation of soil, water, and related natural resources through programs and partnerships with individuals, businesses, organizations, and government. Dennis has a master’s degree in Soil Science and a B.S. degree, Agronomy from the University of Minnesota. Dennis is licensed professional soil scientist (MN) and a certified crop adviser.

Organization: Stearns County Soil and Water Conservation District

Organization Description:

The Stearns County Soil & Water Conservation (SWCD) District is a local unit of government that manages and directs natural resource management programs at the local level. The mission statement of the Stearns County SWCD is to enhance the soil, water, and natural resources necessary for productive and profitable agriculture; safe and affordable drinking water; and wildlife habitat for all Stearns County residents, businesses, and visitors. The Stearns County SWCD works in both urban and rural settings, with landowners and with other organizations, to carry out programs for the conservation and development of soil, water, and related natural resources

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Project Coordinator		Coordinate project			30%	0.06		\$9,000
Grants Administration Coordinator		Coordinate grant reports and budgets			30%	0.09		\$14,000
							Sub Total	\$23,000
Contracts and Services								
University of Minnesota	Sub award	Leading the Kernza research Activity 1. Identify stand renovation methods to increase nitrate leaching mitigation and grain yield in aging Kernza stands. Personnel = \$200,000; Sampling equipment, lab analysis = \$55,000; Research rental fee = \$1500; Travel = \$ 6500 (numbers rounded to approximate value)				6		\$264,000
Ag Utilization Research Institute (AURI)	Sub award	Build sustainable supply chains, enhance utilization, and assess storage and handling techniques for Kernza; and support local grower adoption of Kernza production through outreach and networking. Personnel = \$152,000 Supplies = \$15,000 Contracts = \$22,500 Field Days = \$3000 Travel = \$7500 (Approximate values due to rounding)				1.5		\$200,000
Pope County SWCD	Sub award	Provide field plot research site and field activity coordination. Personnel = \$84,000				1.59		\$84,000
							Sub Total	\$548,000
Equipment, Tools, and Supplies								

							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
							Sub Total	-
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$571,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

Attachments

Required Attachments

Visual Component

File: [c7e938ef-01a.pdf](#)

Alternate Text for Visual Component

As Kernza stands age, they produce fewer seeds but more plants. Preventing yield decline with inter-row cultivation or herbicide - but does this affect nitrate leaching?

Board Resolution or Letter

Title	File
Stearns SWCD Letter	41a9b446-66e.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

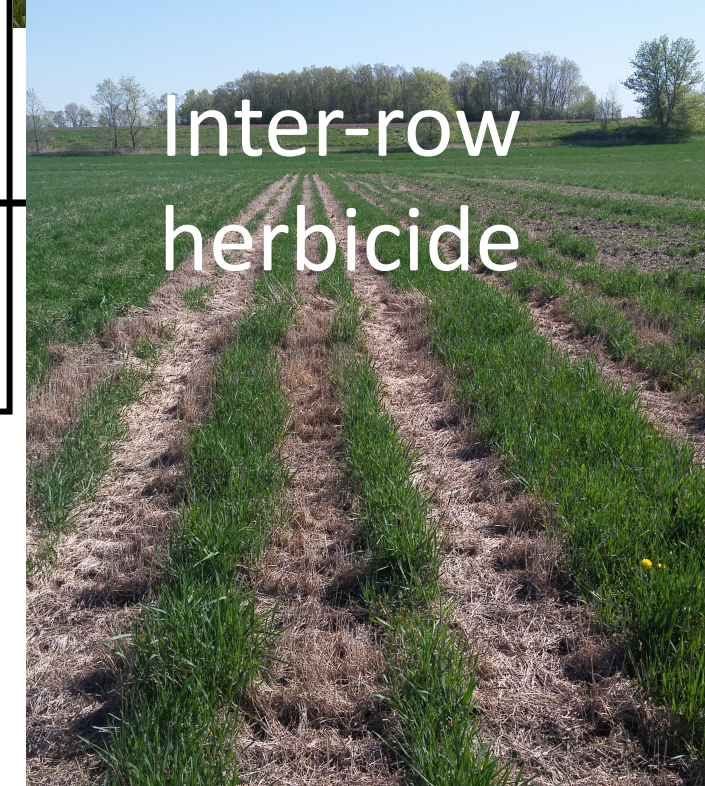
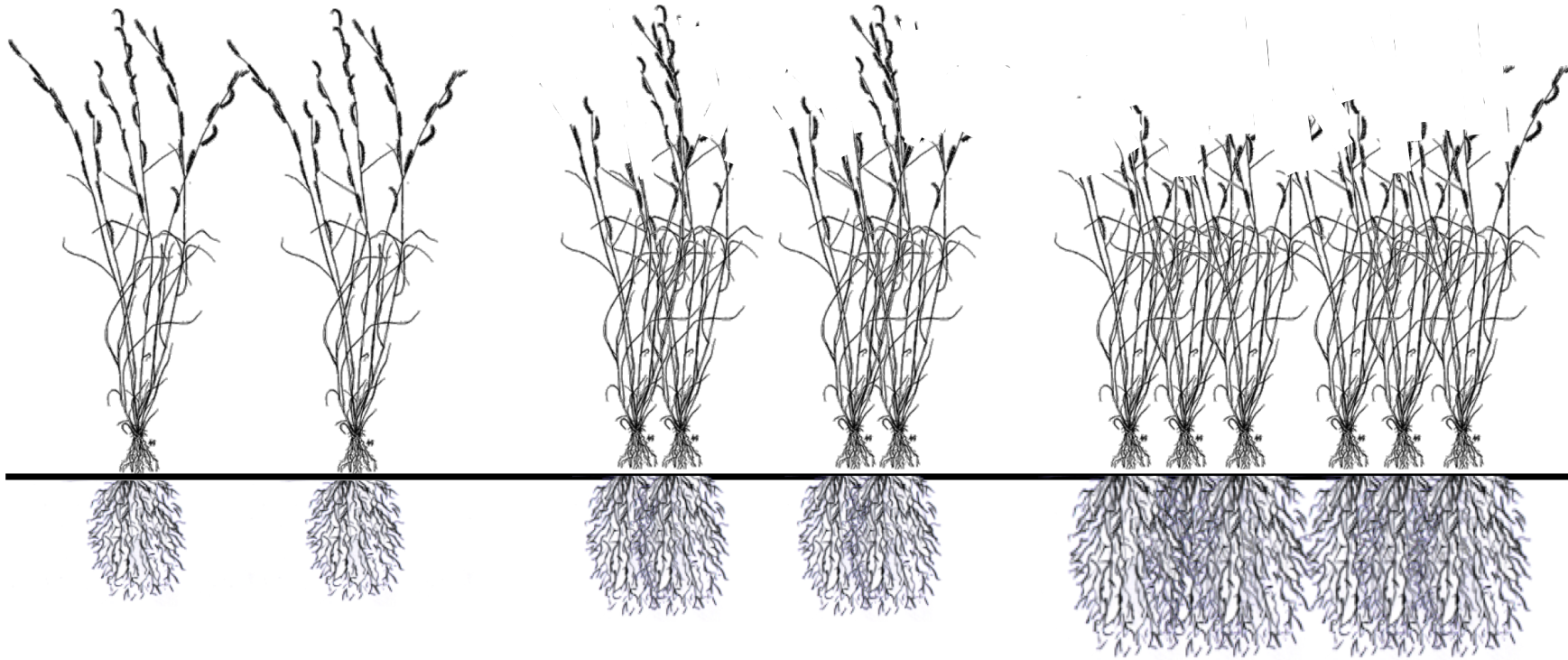
No

As Kernza stands age, they produce **fewer** seeds but **more** plants

Year 1

Year 2

Year 3



Preventing yield decline with inter-row cultivation or herbicide – but does this affect nitrate leaching?

Title: Long-term nitrate mitigation by maintaining profitable Kernza production
Project Lead: Dennis Fuchs