



Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-266

Proposal Title: Sweetening the Crop: Perennial Flax for Ecosystem Benefits

Project Manager Information

Name: Neil Anderson

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

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Project Basic Information

Project Summary: We will produce, select, and evaluate how perennial flax provides ecosystem (pollinator) services for the environment while enhancing yield for oilseed, fiber, and nectar/honey production.

Funds Requested: \$791,000

Proposed Project Completion: June 30 2025

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

Project Location

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

Region(s): SW, SE, NW, Central, Metro,

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.

Lack of food resources (flowers) is a leading cause of declines in pollinator populations and pollinator health. Current cropping systems do not provide adequate resources for pollinators. The University of Minnesota is breeding perennial flax to replace historic annual flax production. We seek funding to provide early stage crop development data, before direct commercialization. Establishing perennial flax as a reinvigorated oilseed and fibercrop and a new honey crop has the potential to improve seed/fiber/honey yield for farmers (2x harvest/yr.) and provide ecosystem services for pollinators (flowering May-November) within conventional cropping. The early/long flowering provides an unparalleled opportunity to provide resources to hundreds of pollinators. We will experimentally test the effectiveness of perennial flax for ecological services (pollinators, honey production) and realizable harvestable units for oilseed (yield, chemicals, proteins) and fiber types. This will provide critical selection data/breeding directives for the best lines for crop launching. We will communicate the economic potential of perennial flax oilseed/fiber/honey cropping with market pathway and supply-chain analyses. Communication of research findings and best practices with field days, farm demonstrations, and "AURI connects: Fields of Innovation" programming will support adoption of perennial flax to benefit Minnesotans.

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.

A variety of benefits, particularly ecosystem services, are realizable with perennial flax, which we aim to research and generate data during the 3-year period: pollinator services (pollen/nectar sources enhance pollinator activity late into the fall), yield and chemical contents of harvestable products (oilseed, fiber, pollen, nectar/honey), and increased yield (two harvests/year instead of one with annual flax). Experimental and outreach plans include: Activity 1 involves breeding/selecting/evaluating perennial flax for pollinator/landscape services and yield for food product analyses (honey, oilseed, fiber and chemical constituents). Activity 2 concentrates research on perennial flaxseed yield and human/animal nutrient contents for oil, protein, amino acid, and meal. In Activity 3, the business development team will establish supply chain opportunities and investigate new markets for perennial flax, the technical team of process engineers, food scientists and analytical scientists will analyze perennial flax for food product development, assessing flax seed, oil, and honey. Finally, in Activity 4, outreach to stakeholders and clientele groups will build awareness, education and promote discussion of perennial flax in field days and programming. Results will guide future development with businesses for commercialization of perennial flax-based products.

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?

Our project will use methods and channels to conduct research, share findings and build awareness of environmental benefits and market potential of perennial flax: identifying valuable end use(s) with value to MN farmers and citizens, enhanced pollinator services, high oilseed, protein, fiber, & gene pool enhancement. Reports will be available via U of M and AURI websites. Project partners will present at events with broad and varied audiences: perennial flax field days, annual AURI "Fields of Innovation". We will engage with print, broadcast, internet media to seek project coverage and build public awareness.

Activities and Milestones

Activity 1: Producing, evaluating and selecting perennial flax for pollinator services, nectar components

Activity Budget: \$317,124

Activity Description:

Flax may be a unique nectar source for bees (native, honey) for pollinator / ecosystem services and a new source of nutrient-rich honey. Objectives of this research are to quantify honey bee and native pollinator activity in perennial flax fields, nectar production, potential for honey production, and chemical constituents with nutritional value for bees. Yr. 1 walking surveys (sweep netting; observational) will be conducted in established fields to survey diversity and abundance of foraging bees and if they are collecting pollen and/or nectar. Honey bee colonies at plot edges will be used to measure weight gain; the proportion of colony pollen diet from flax. Nectar production data from sampling flax flowers (microcapillary tube spinouts) includes volume, nectar chemistry (amino acids, sugar types, concentrations, content). Yrs. 2-3 will focus on flax selections identified (Yr. 1) with high levels of nectar/pollen to conduct additional pollinator activity surveys, examine nectar/pollen for nutritional and nutraceutical components (lipids, proteins, phytochemicals), evaluate whether these compounds impact pollinator health and assess honey value for human consumption. AURI (Activities 3-4) will use yield and economic data on pollen/nectar sources to enhance pollinator activity and harvestable products (nectar, honey) to create business development model(s).

Activity Milestones:

Description	Completion Date
Quantify pollinator activity	December 31 2023
Determine nectar and pollen production	December 31 2024
Determine pollen, nectar & honey nutritional, nutraceutical components	June 30 2025

Activity 2: Evaluation of yield for high value perennial oilseed to provide oil, proteins and meal for human/animal nutrition

Activity Budget: \$192,648

Activity Description:

There is a global challenge to address food security and preserve land/water resources; consumers seek transparency and sustainability in their food supply. Food industries are interested in commercializing products formulated with ingredients derived from such crops; farmers are motivated to plant a crop with a strong market. As an oilseed, flaxseed is high in oil, fat, proteins, and flax meal is a useful byproduct. The proposed work involves a concerted effort from breeders, food scientists, and engineers to lead perennial flax development as a viable source of plant ingredients. Specific objectives are: Measure flowering/seed ripening periods (Yrs. 1-3); mechanical harvesting 2x/yr at 4 sites (St. Paul, Rosemount, Lamberton, Morris) will determine seed yield in Yrs. 1-3 (wt., size, oil, omega-3 content, meal); wherein protein extraction methodologies will be developed to produce protein isolates; followed by screen breeding lines for protein profile, structure, and functionality (Yrs. 1-3). Residual plant material will be used to study fiber potential in Activity 3. Generated data will direct the breeding program. AURI (Activities 3-4) will use yield and economic data on oilseed sources to enhance harvestable products (oilseed, oils, proteins, amino acids, omega-3s, meal, fiber) to create business development model(s).

Activity Milestones:

Description	Completion Date
Grow, harvest, determine yield components	December 31 2023
Oilseed extraction, chemical/nutritional profile determinations	December 31 2024

Breeding line evaluations (oil, proteins)	June 30 2025
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Activity 3: Assess value-added processes and products to support development of economically sustainable supply-chains for perennial flax in Minnesota.

Activity Budget: \$179,432

Activity Description:

Work in this activity will examine uses of perennial flax and support the development of sustainable supply chains through technical assistance, commercialization, and stakeholder engagement. Using residual plant material harvested in Activity 2, an additional objective is to determine flax fiber yield (biomass, fiber type, length/width, tensile strength), suitable harvesting methods (hand harvest/rolling, mechanical) and determination of fiber potential in perennial flax based on these characteristics. Providing ecosystem services and economically-valuable products from perennial flax requires investigations into business development. We will use yield and economic data generated on pollen/nectar sources to enhance pollinator activity late into the fall and harvestable products (oilseed, fiber, nectar and honey, fiber) to create business development model(s). The business development team will establish supply chain opportunities and investigate new markets for perennial flax by engaging with private businesses (food, feed, bio-based materials) and other key value chain stakeholders.

Activity Milestones:

Description	Completion Date
Determine economic potential	June 30 2025
Identify market opportunities (supply chains)	June 30 2025
Determine food product uses	June 30 2025
Assess fiber potential	June 30 2025

Activity 4: Education and outreach on perennial flax production

Activity Budget: \$101,796

Activity Description:

AURI staff will help organize and participate in two perennial flax field days over the grant period to assist in building awareness and educating key stakeholders about perennial flax with demonstrations to highlight perennial flax production and environmental benefits to farmers, beekeepers, government officials, local businesses, educators, and students. In addition to the field days, AURI will also include perennial flax programming at one "AURI Connects: Fields of Innovation" event each year during the project to facilitate discussion, build awareness, and disseminate information about perennial flax and its market potential. We will communicate results derived from Activities 1-3 so beekeepers, farmers, and processors can be informed on requirements to produce/process perennial flax, as well as the environmental and economic benefits of production (oilseed, fiber, and nectar/honey). Potential nutraceutical benefits of flax oilseed and honey will also be highlighted.

Activity Milestones:

Description	Completion Date
Provide summary of market potential and supply chains in Minnesota from discussions with industry representatives. Present findings at perennial flax field days.	November 30 2024
Present economic findings (field days)	June 30 2025
Relay market opportunities	June 30 2025
Provide summary of market potential and supply chains in Minnesota from discussions with industry representatives. Present findings at perennial flax field days.	June 30 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Donald Wyse	University of Minnesota, Department of Agronomy & Plant Genetics	Co-project Lead for perennial flax breeding & research; all activities	Yes
Kevin Betts	University of Minnesota, Department of Agronomy & Plant Genetics	Researcher on perennial flax; field production, maintenance, harvest for all Activities	Yes
Constance Carlson	University of Minnesota, Forever Green Initiative (FGI)	Engaged with MN Sustainable Farming Association and UMN Extension: Regional Sustainable Development Partnerships, market development, industry engagement, education and outreach, primarily working with Activities 2 - 4	Yes
Bareem (Pam) Ismael	University of Minnesota; Plant Protein Innovation Center	Protein analysis of seed samples, Activity 2; help with Activities 3-4	Yes
Marla Spivak	University of Minnesota, Department of Entomology	Pollinators, honey bee behavior, pollinator habitat, Activity 1; help with Activities 3-4	Yes
Daniel Cariveau	University of Minnesota, Department of Entomology	Native, wild pollinators, ecology, pollinator habitat Activity 1; help with Activities 3-4	Yes
Clay Carter	University of Minnesota, Department of Plant and Microbial Biology	Analyses of nectar, honey Activity 1; help with Activities 3-4	Yes
Colin Cureton	University of Minnesota, Forever Green Initiative (FGI)	FGI Commercialization team; economics of perennial flax production with emphasis on profitability for growers; support pilot production; organize scale-up; advise future IP and release strategies. Activities 3,4	Yes
Michael Stutelberg	Agricultural Utilization Research Institute (AURI)	Lead supply chain activities, AURI Scientist (chemist) analytical testing; primarily Activities 3, 4	Yes
Harold Stanislawski	Agricultural Utilization Research Institute (AURI)	AURI fiber, seed expert; primarily Activities 3, 4	Yes
Matthew Leiphon	Agricultural Utilization Research Institute (AURI)	Project manager, AURI; primarily Activities 3, 4	Yes

Jennifer Wagner-Lahr	Agricultural Utilization Research Institute (AURI)	Commercialization for AURI; primarily Activities 3, 4	Yes
Alan Doering	Agricultural Utilization Research Institute (AURI)	Fiber and seed processing, AURI; primarily Activities 3, 4	Yes
Riley Gordon	Agricultural Utilization Research Institute (AURI)	Engineer, Fiber and seed processing, AURI; primarily Activities 3, 4	Yes
Abel Tekeste	Agricultural Utilization Research Institute (AURI)	Fiber and seed processing, AURI; primarily Activities 3, 4	Yes
Nan Larson	Agricultural Utilization Research Institute (AURI)	Director of Innovative Networks, AURI, and will oversee networking and events associated with this project. Activities 3, 4	Yes
Erik Evans	Agricultural Utilization Research Institute (AURI)	Director of Communications, AURI, and will participate in networking and outreach events to help build the supply chain for this project. Activities 3, 4.	Yes
Shelby Thooft	Agricultural Utilization Research Institute (AURI)	Associate Scientist, Chemistry, AURI. Assist in chemical analysis, Activities 3, 4	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 research 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 breeding and early research to develop new crops. LCCMR funds are crucial for studying the environmental aspects of new crops and supporting field-scale deployment of perennial flax – which we have demonstrated from previous LCCMR appropriations. 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
Enhancing Pollinator Landscapes	M.L. 2014, Chp. 226, Sec. 2, Subd. 06a	\$864,000

MITPPC #7: Tools to Distinguish Native from Exotic Reed Canary Grass	M.L. 2015, Chp. 76, Sec. 2, Subd. 06a	-
MITPPC 12: Developing Robust Identification Assays for Amaranthus Palmeri in Seed Mixtures	M.L. 2015, Chp. 76, Sec. 2, Subd. 06a	-
Data-Driven Pollinator Conservation Strategies	M.L. 2016, Chp. 186, Sec. 2, Subd. 03a	\$520,000
Bee Pollinator Habitat Enhancement - Phase II	M.L. 2016, Chp. 186, Sec. 2, Subd. 08a	\$387,000
Pollinator Research and Outreach	M.L. 2017, Chp. 96, Sec. 2, Subd. 03n	\$500,000
Farmer-Led Expansion of Alfalfa Production to Increase Water Protection	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 04i	\$500,000
Using Perennial Grain Crops in Wellhead Protection Areas to Protect Groundwater	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 04j	\$250,000
Develop BioMulch to Replace Plastic Soil Covering in Vegetable and Fruit Production to Increase Yield and Reduce Waste	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 08b	\$310,000
Accelerating Perennial Crop Production to Prevent Nitrate Leaching	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04k	\$440,000
Farm-Ready Cover Crops for Protecting Water Quality	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04l	\$741,000

Project Manager and Organization Qualifications

Project Manager Name: Neil Anderson

Job Title: Professor

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

Neil Anderson is a Full Professor and J. William Fulbright Scholar, directing the Herbaceous Ornamental Breeding Program for the University of Minnesota, Dept. of Horticultural Science. His lab focuses primarily on winter-hardy herbaceous perennials with ornamental/agronomic value as well as R&D on ornamental plant crops which produce natural compounds useful as green pesticides. Additional research focuses on preventing invasiveness of ornamental crops during domestication. The program releases many asexually-propagated crops with Intellectual Property filings around the world. Professor Anderson is an internationally recognized expert in plant reproductive biology (crossing barriers), invasive species biology, geophytes, rapid generation cycling crops, tissue culture, molecular biology, plant breeding and genetics. In addition, his program also is involved in risk assessment to prevent new invasive species from being introduced into the market and causing future problems. His crop specialty is the genus Chrysanthemum, focusing on herbaceous perennial crops : pyrethrum, ornamentals, and the salt-tolerant N. American species. Additional herbaceous perennial crops being bred by his program include: Linum, Lilium, Gladiolus, Iris, Schoenocaulon, and Gaura. He is the lead flax breeder at the University of Minnesota, in cooperation with co-PI, Professor Donald Wyse. Seed protein content, nectar, fiber and nutraceutical production are of particular interest in his Linum (flax) breeding program. He is also a recognized plant explorer, having collected wild species of ornamental interest across the globe, in areas as diverse as the United States, Argentina, and South Africa. Dr. Anderson leads large lab research teams of scientists working on these crops (1 postdoc, 3 research scientists, 8 graduate students, 13 undergraduate students) and advises undergraduate / graduate students. He is adept in management of interdisciplinary research teams - both locally, regionally, nationally, and internationally - and experienced in managing large grants. (300 word limit)

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

Organization Description:

The University of Minnesota is a federal land grant public institution of higher learning. The above referenced proposal is hereby endorsed, and submitted, on behalf of the Board of Regents of the University of Minnesota. The University of Minnesota is registered in the FDP FCOI Clearinghouse certifying it has an active and enforced Conflict of Interest policy that is consistent with the provisions of 42 CFR part 50, Subart F, and 42 CFR part 94. The University of Minnesota's

5/10/2021

frequently requested institutional information, including EIN, DUNS, and SAM information can be found on our website at <https://research.umn.edu/units/spa/proposals/proposal-development/frequently-requested-institutional-information>. The current negotiated F&A rate agreement can be found on our website at <https://research.umn.edu/units/oaca/fa-costs/fa-rate-agreements>. Questions concerning programmatic aspects of the project should be directed to the Principal Investigator. Those having to do with contract and budgetary matters should be directed to LJ Turgeon at singh320@umn.edu in the Office of Sponsored Projects Administration.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Faculty, Dr. Baraem Ismail / Salary and Fringe		Conduct, analyze seed protein research, Activity 2; consult with Activities 3-4; advise 1-M.S. student and 1-PostDoc / Yr. 1: 1%=\$1387; Yr. 2: 1% pay=\$1415; Yr.3: 1% pay=\$1443;			36.5%	0.03		\$5,794
Professional and Admin, Constance Carlson / Salary and Fringe		Engaged with MN Sustainable Farming Association and UMN Extension: Regional Sustainable Development Partnerships, / market development, industry engagement, education and outreach, primarily working with Activities 2 - 4			36.5%	0.3		\$39,117
Professional and Admin, Colin Cureton / Salary and Fringe		FGI Commercialization team / economics of perennial flax production with emphasis on profitability for growers; support pilot production; organize scale-up; advise future IP and release strategies. Activities 3,4			36.5%	0.15		\$19,558
PostDoc and Research Specialist (to be determined) / Salary and Fringe, 20% of \$50K salary		Protein analysis of seed samples / Activity 2; help with Activities 3-4 "			25.4%	0.1		\$12,540
Ph.D. graduate student, 50% RA, Applied Plant Sciences Graduate Program / Salary + Tuition (Academic Yr.) + Fringe (Academic Summer) - Grad Students (Acad/Summer)		Conduct Activity 1 research experiments / coordinate harvests with engineers/staff for Activities 1-3			19.9%	1.5		\$149,520

M.S. Food Science graduate student, 50% RA, Yrs. 2-3 / Salary + Tuition (Academic Yr.) + Fringe (Academic Summer) - Grad Students (Acad/Summer)		Conduct Activity 2 research experiments / coordinate harvests with engineers/staff for Activities 3-4			19.9%	1		\$92,232
Undergraduate Students / 1-3 undergrads at \$12/hr.; 5-10 hrs/wk during semesters; possibly FT in summers; \$10,000/yr		Conduct Activity 1 research experiments and coordinate harvests with engineers/staff for Activities 1-3 "			0%	0.75		\$30,000
Civil Service, Kevin Betts (flax production), 15% time / Salary + Fringe		Researcher on perennial flax; field production, maintenance, harvest for all Activities			31.8%	0.45		\$42,871
Civil Service, 25% technician (nectar chemistry; \$50k base) / Salary + Fringe		Nectar chemistry analyses / Activity 1			31.8%	0.75		\$50,421
Civil Service, Honey bee technician, 25% time @ \$55,000/yr / Salary + Fringe		Pollinator studies / Activity 1			31.8%	0.75		\$55,463
							Sub Total	\$497,516

Contracts and Services								
Agricultural Utilization Research Institute (AURI)	Sub award	Technical staff for Activities 3-4; Michael Stuteberg: Lead supply chain activities, Scientist (chemist) analytical testing; Rod Larkin: fiber, seed; Harold Stanislawski: Economics, fiber processing; Matthew Leiphon: Project manager, AURI; Jennifer Wagner-Lahr: Commercialization for AURI; Riley Gordon: Engineer, Fiber and seed processing; Abel Tekeste: Fiber/seed processing; AURI Dir. Innovative Networks				1.92		\$180,035
							Sub Total	\$180,035
Equipment, Tools, and Supplies								
	Tools and Supplies	Lab/field/greenhouse or Medical Supplies (field supplies, weed control, greenhouse/lab supplies, harvesting supplies (\$3,584/yr); plant protein analyses (\$5K/yr); bee supplies, Yr. 1: Pollen traps (6 colonies/ 9 locations = 54 traps, \$65 each)=\$3510; Sweep nets (\$30/each x 5)=\$150; Soxhlet extractor (lipid analysis)=\$300; Supplies (recurring, Yrs.1-3): Pollen analysis supplies, 10 boxes 100 glass slides (Glycerine, Calberla's solution)= \$840/yr; Pollen Substitute: MegaBee patties \$2.00/colony x 135 colonies fed 2x/mo, 4 mos=\$2160/yr; Protein and Fat analysis, Individual colony samples @ 12/site x 9 x 5 alternate month x \$10 = \$5,400/yr; Nectar chemistry analyses (amino acids and sugar types, concentrations, content): Nectar amino acid analyses (19 genotypes x 3 reps x 3 years x 3 sites x \$30/sample for LC MS time) = \$15,390 (\$5,130/yr); Reagents & supplies for sugar analyses = \$1,500 (\$500/yr): TOTAL/YR.=\$14,030)	Ensure all experimentation for research activities can be completed, such as lab experiments, greenhouse production / propagation, field production, all processing					\$71,802
							Sub Total	\$71,802
Capital Expenditures								
							Sub Total	-

Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel by Activities 1-4 Research Teams: \$0.56/mile x 4068 mi./yr, M&EI @\$55/day @\$x 40 d/yr (Lamberton, Morris, Rosemount), lodging @\$99/day (Crookston), @\$x 12 d/yr	Travel to/from sites for all Activities and all Personnel; field production, irrigation, herbicide applications, data collection, seed.fiber harvests, pollinator studies					\$16,999
							Sub Total	\$16,999
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
		Greenhouse space rental (St. Paul); all Activities; all years	Greenhouse space rental, needed to produce plants for field trials, and maintain stock plants for propagation and crossings; greenhouse: 375 ft2 x \$0.0308/ft2/day x 365 days = \$4,216/yr for 3 yrs.					\$12,648
		Actiivity 1; Plot charges: \$1000/site x 4 ROCs x 3 years	Field plot charges to produce acreage of perennial flax for 1+A/site at Rosemount, Lamberton, Morris, St. Paul; all years; all activities					\$12,000
							Sub Total	\$24,648
							Grand Total	\$791,000

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: [9620ca1e-667.pdf](#)

Alternate Text for Visual Component

Overview. The University of Minnesota is breeding perennial flax to replace historic annual flax production in MN. Establishing perennial flax (*Linum* spp.) as a reinvigorated oilseed/fiber and a new honey crop has the potential to improve yield for farmers (with 2x harvest/yr.) and provide ecosystem services for pollinators (flowering May-November). We seek funding to provide early-stage crop development data before direct commercialization and have assembled a state-wide team of experts to ...

Optional Attachments

Support Letter or Other

Title	File
AURI Subcontract Budget Justification	49459c78-f4d.pdf
AURI Subcontract Budget	6724384d-120.pdf
AURI Scope of Work	f7d77019-c24.pdf
Perennial Flax LCCMR 2021- AURI Subrecipient Commitment Form	01a3424c-d7a.pdf
Cover Letter, University of Minnesota	70abc512-90d.docx

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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

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

SWEETENING THE CROP: PERENNIAL FLAX FOR POLLINATOR/ECOSYSTEM BENEFITS

PROJECT ID: [TBD]

OVERVIEW:

The University of Minnesota is breeding perennial flax to replace historic annual flax production in MN. Establishing perennial flax (*Linum* spp.) as a reinvigorated oilseed/fiber and a new honey crop has the potential to improve yield for farmers (with 2x harvest/yr.) and provide ecosystem services for pollinators (flowering May-November). We seek funding to provide early-stage crop development data before direct commercialization. We will produce, select, test and evaluate how perennial flax enhances yield for commercial uses of oilseed, fiber, honey production and ecosystem services.

HONEY

THE PROBLEM:

Need for perennial, extended season flowering crops to support pollinators and honey production

THE SOLUTION:

Breeding and selection of perennial flax for long flowering time and pollinator attractants (Activity 1)



THE ACTIVITIES:

Pollinator visitation and pollen, nectar/honey production studies to enhance breeding and selection

OILSEED

THE PROBLEM:

Need for high value perennial oilseed crop to provide oil and meal for human/animal nutrition

THE SOLUTION:

Perennial flax with enhanced omega-3, protein, amino acid profile as alternative to annual flax (Activity 2)



THE ACTIVITIES:

Food chemistry to ID high value nutritive components, yield studies to enhance breeding and selection

FIBER

THE PROBLEM:

Need to develop economically viable uses for crop fiber residue from 2x harvests/yr.

THE SOLUTION:

Perennial flax with enhanced fiber yield/quality identified by engineers and chemists (Activity 3)



THE ACTIVITIES:

Determine fiber type/quality/yield for potential industrial uses and to enhance breeding and selection

AURI CONNECTS

Develop market pathways, supply-chain development for economic potential (Activity 3); disseminate results to environmental & agricultural stakeholders through field days, farm demonstrations and AURI CONNECTS (Activity 4).



Funding for this project requested from the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR)

PERENNIAL FLAX
PROJECT
PARTNERS

UNIVERSITY OF MINNESOTA –
FOREVER GREEN



UNIVERSITY OF MINNESOTA –
BEE LAB



UNIVERSITY OF MINNESOTA –
PLANT PROTEIN INNOVATION
CENTER



AGRICULTURAL UTILIZATION
RESEARCH INSTITUTE



