



Environment and Natural Resources Trust Fund

M.L. 2022 Approved Work Plan

General Information

ID Number: 2022-266

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: June 20, 2022

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

Project Budget: \$490,000

Project Manager Information

Name: Neil Anderson

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

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Project Reporting

Date Work Plan Approved by LCCMR: June 27, 2022

Reporting Schedule: March 1 / September 1 of each year.

Project Completion: June 30, 2025

Final Report Due Date: August 14, 2025

Legal Information

Legal Citation: M.L. 2022, Chp. 94, Art. , Sec. 2, Subd. 03I

Appropriation Language: \$490,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to produce, select, and evaluate how perennial flax provides pollinator and other ecosystem services while enhancing yield for oilseed, fiber, and honey production.

Appropriation End Date: June 30, 2025

Narrative

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.

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? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & 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.

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

Activities and Milestones

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

Activity Budget: \$180,343

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. Existing honey bee colonies will be placed at plot edges 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 (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

Activity Milestones:

Description	Approximate Completion Date
Quantify pollinator activity, such as rate/frequency of visitation (field, year 1)	December 31, 2023
Determine nectar and pollen production per plant or field plantings (field and lab; 2 yrs.)	December 31, 2024
Determine pollen, nectar & honey nutritional, nutraceutical components in flax (lab; years 1-3)	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: \$78,372

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	Approximate Completion Date
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Grow, harvest, determine plant growth (flowering, etc.) and seed or fiber yield components (field; Yr. 1)	December 31, 2023
Oilseed extraction, chemical/nutritional profile determinations (lab; Years 1-2)	December 31, 2024
Breeding line evaluations of yield components (oil, proteins, fiber) (lab; Years 1-3)	June 30, 2025

Activity 3: Assess value-added processes and products to support development of economically sustainable supply-chains for perennial flax in Minnesota.

Activity Budget: \$132,233

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. Food uses of seed proteins, oils, nectar/honey, etc. derived from flax will be determined to provide an initial assessment of possible venues for commercialization. These will be basic studies (cooking, baking) with cooks and chefs to promote later startups in creation of perennial flax food derivatives and recipes. 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	Approximate Completion Date
Determine economic potential (lab; Years 1-3)	June 30, 2025
Identify market opportunities (supply chains) of the various derived products (lab, Years 1-3)	June 30, 2025
Determine food product uses to enhance cooking/baking uses (lab; Years 1-3)	June 30, 2025
Assess fiber potential; determine fiber lengths and types and potential uses thereof (lab; Years 1-3)	June 30, 2025

Activity 4: Education and outreach on perennial flax production

Activity Budget: \$99,052

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	Approximate Completion Date
Provide summary of market potential and supply chains (field; Years 2-3)	November 30, 2024
Present economic findings (field days) (field; Years 2-3)	June 30, 2025
Relay market opportunities (field, publications; Years 2-3)	June 30, 2025
Provide summary of market potential and supply chains in Minnesota (field; Years 2-3)	June 30, 2025
Discuss market opportunities and supply chain findings of perennial flax (field; Years 2-3)	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	No
Kevin Betts	University of Minnesota, Department of Agronomy & Plant Genetics	Researcher on perennial flax; field production, maintenance, harvest for all Activities	No
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	No
Daniel Cariveau	University of Minnesota, Department of Entomology	Native, wild pollinators, ecology, pollinator habitat Activity 1; help with Activities 3-4	No
Clay Carter	University of Minnesota, Department of Plant and Microbial Biology	Analyses of nectar, honey Activity 1; help with Activities 3-4	No
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, Harold Stanislawski, Matthew Leiphon, Jennifer Wagner-Lahr, Alan Doering, Riley Gordon, Abel Tekeste, Nan Larson, Erik Evans, Shelby Thooft	AURI	Lead supply chain activities (primarily Activities 3, 4 but also aiding personnel in Activities 1, 2), AURI scientists for analytical testing (engineering, chemistry, fiber, oil, seed and fiber processing), commercialization, supply chain, networking, events associated with this project	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.

AURI and FGI 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. FGI staff will coordinate with Dr. Ismail's UMN Plant Protein Innovation Center's Research Spotlight Forum to share perennial flax protein characterization research with global food and beverage industry leaders. 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 to inform farmers and processors 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 nectar will also be highlighted. Two end-use application bulletins associated with supply chain opportunities and new markets for perennial flax (food, feed, bio-based materials) will be developed to communicate findings to industry stakeholders, 1) a summary the nutritional and functional characteristics of perennial flax seed, oil and meal and near term food applications, 2) a summary of the protein characteristics and functionality for use in product development. In all verbal and written communications, we will acknowledge this funding through use of the ENRTF logo, tagging ENRTF on social media and/or specific attribution language. For verbal communications, the following language will be used: "Funding provided by the Minnesota Environment and Natural Resources Trust Fund." whereas for written communications, we'll acknowledge ENRTF funding by stating that "Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR)." When possible, additional wording will be added on to include specific of the ENRTF funding, such as the recommended wording: "The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources." - or - "Currently 40% of net Minnesota State Lottery proceeds are dedicated to growing the Trust Fund and ensuring future benefits for Minnesota's environment and natural resources."

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 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

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%	0.24		\$32,598
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
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		Conduct Activity 1 research experiments and coordinate harvests with engineers/staff for Activities 1-3 "			0%	0.75		\$25,980

\$12/hr.; 5-10 hrs/wk during semesters; possibly FT in summers; \$8660.33/yr								
Civil Service, 25% technician (nectar chemistry; \$50k base) / Salary + Fringe		Nectar chemistry analyses / Activity 1			31.8%	0.75		\$32,950
Civil Service, Honey bee technician, 25% time @ \$55,000/yr / Salary + Fringe		Pollinator studies / Activity 1			31.8%	0.75		\$55,463
							Sub Total	\$277,115
Contracts and Services								
Agricultural Utilization Research Institute (AURI)	Professional or Technical Service Contract	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		\$147,125
							Sub Total	\$147,125
Equipment, Tools, and Supplies								
	Tools and Supplies	Field Supplies	weed control (herbicides, cultivation), harvesting supplies (\$3,584/yr x 3 yrs); Yr. 1: Pollen traps (6 colonies/ 9 locations = 54 traps, \$65 each)=\$3510; Sweep nets (\$30/each x 5)=\$150; Pollen Substitute: MegaBee					\$20,892

			patties \$2.00/colony x 135 colonies fed 2x/mo, 4 mos=\$2160/yr x 3 yrs.;					
	Tools and Supplies	Lab Supplies	plant protein analyses (\$5K/yr x 2 yrs.); Soxhlet extractor (lipid analysis)=\$440; Supplies (recurring, Yrs.1-3): Pollen analysis supplies, 10 boxes 100 glass slides (Glycerine, Calberla's solution)= \$840/yr; Protein and Fat analysis, Individual colony samples @ 12/site x 9 x 5 alternate month x \$10 = \$5,400/yr x 2 yrs; Nectar chemistry analyses (amino acids and sugar types, concentrations, content): Nectar amino acid analyses (19 genotypes x 3 reps x 2 years x 3 sites x \$30/sample for LC MS time) = \$10,260 (\$5,130/yr); Reagents & supplies for sugar analyses = \$1,500 (\$500/yr); None of these are lab fees to use a lab, rather supply costs to run machines. Thus, the \$30/sample is used to calculate the supply needs for this analysis.					\$35,520
							Sub Total	\$56,412
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					\$9,348

							Sub Total	\$9,348
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$490,000

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				
In-Kind	Overhead rate, 55% of total (minus tuition costs of \$35,212); calculated as: $\$490,000 - \$35,212 = \$454,788 \times 0.55 = \$250,133.40$	none - this isn't being paid to the University of Minnesota;	Potential	\$250,133
			Non State Sub Total	\$250,133
			Funds Total	\$250,133

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
Cover Letter, University of Minnesota	2071ec6d-938.pdf
Perennial Flax LCCMR 2021- AURI Subrecipient Commitment Form	01a3424c-d7a.pdf
AURI Scope of Work	f7d77019-c24.pdf
AURI Subcontract Budget	dc347834-57f.pdf
AURI Subcontract Budget Justification	77df534f-302.pdf
Background Check Certification	98de3802-b57.pdf
Responses to Revision Requests	a0374eb9-abf.pdf
Approved Research Addendum	059b501a-778.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Due to budget reductions, we dropped several sections of the grant which included breeding/selection for non-shattering, the molecular SNP and GWAS research (primarily Activity 2; these include dropping 1-Ph.D. student, 1-research scientist, field/greenhouse charges), as well as eliminating amino acid analysis in nectar chemistry (Activity 1). AURI contract was reduced in most areas across all activities.

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 agree travel expenses must 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 agree to the UMN Policy.

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

Yes

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

Yes

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

No

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

