Environment and Natural Resources Trust Fund
2014 Request for Proposals (RFP)

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Project Title:

Maintaining Expiring CRP Land Benefits Using Integrative Cropping

Category: E. Air Quality, Climate Change, and Renewable Energy

Total Project Budget: $ 467,000

Proposed Project Time Period for the Funding Requested: 4 Years, July 2014 - June 2018

Other Non-State Funds: $ 0

Summary:

Develop and evaluate alley cropping agroforestry systems as continuous living covers to maintain the environmental benefits gained of expiring CRP lands while providing economic opportunities for farmers and rural communities.

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Sponsoring Organization: U of MN

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Web Address

Location

Region: Statewide

County Name: Statewide

City / Township:

MP: 0613-2-126-proposa
Budget: 0613-2-126-bud
Qual: 0613-2-126-qualifi
Map: 0613-2-126-map-Z
Resolution:
List:

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base	
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency	
Capacity	Readiness	Leverage	Employment	TOTAL

PROJECT TITLE: Maintaining Expiring CRP Land Benefits Using Integrative Cropping

I. PROJECT STATEMENT

The goal of this project is to develop a combined cropping system using agroforestry for use on expiring Conservation Reserve Program (CRP) lands such that farmers and rural communities can maintain environmental and economic opportunities from these lands. Land enrolled in CRP contributes significantly to national efforts to improve bee habitat, soil, water and air quality, prevent soil erosion, protect environmentally sensitive land, enhance wildlife populations, reduce greenhouse gas emissions (nitrous oxide – N_2O, carbon dioxide - CO_2, and methane –CH_4) and sequester soil carbon. Contracts for more than 800,000 acres of Minnesota's CRP land are due to expire within the next five years. If farmers convert these acres into intensive annual row crop production systems, such as corn and soybeans, the environmental benefits gained from the CRP program will be lost. Environmentally and economically attractive alternatives are needed. Agroforestry, a combined cropping system, is one such approach.

Agroforestry is the practice of integrating woody (trees or shrubs) and herbaceous (agronomic or horticultural) crops together in one intensive and integrated management system that makes environmental stewardship profitable. Alley cropping, a form of agroforestry, refers to a layout in which the herbaceous crops are grown in the alleys between widely spaced bands of shrubs to facilitate management of both shrub and crops while enhancing the synergistic (or minimizing the competition) benefits of their interactions. Grown together, these crops can provide both environmental (e.g., enhance C sequestration, reduce greenhouse gas emissions, improve water quality, enhance habitat for wildlife, bees and other pollinators, and for native predators of crop pests, and minimize effect of drought) and economic benefits (e.g., biomass for energy, food products for the community). Alder, willows, and hazelnuts could serve as the woody plant base for profitable alley cropping systems when grown in association with native polycultures, intermediate wheatgrass, alfalfa, pennycress, corn, and soybeans.

This project aligns with the goal of the Minnesota Prairie Conservation Plan (MPCP) to preserve the state's prairie region. Specifically, that plan provides broad recommendations for grassland conservation across the landscape in its "agricultural matrix" component. That "agricultural matrix" aims to provide 40% perennial cover on the 21.7 million acres in Minnesota which are devoted to agricultural production to mimic the condition of the landscape 60 year ago under a diverse mix of row crops, small grains, fallow period, hedgerows along fence lines and pasture. Application of agroforestry fits very well in this component of the plan.

Furthermore, a range of approaches have been evaluated to minimize the environmental impacts of converting CRP land into row crop systems including the use of no-till and strip till systems, pasture, and cover crops. However, no studies have evaluated the potential of agroforestry, particularly alley cropping systems, as a perennial continuous living cover system to maintain the intended environmental functions of expired CRP lands while producing economically beneficial feedstocks for food, energy, feed, and fiber. Results of the study will be applicable statewide.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Conduct a pre-survey of farmers to identify adoption barriers **Budget: $ 15,806**

We will survey farmers to identify barriers to adoption of agroforestry as a continuous living cover and will conduct outreach activities with farmers, other land managers, bankers, and policy makers. Strategies to direct outreach activities based on survey results will be identified.

Outcome	Completion Date	
1. Pre-survey questionnaires developed and survey protocol approved by Institutional Review Board of the University of Minnesota	December 2014	
2. Survey questionnaires mailed to 1250 farmers in Southwest, West-Central and Northwest regions of Minnesota	January 2015	
3. Survey of farmers completed, data analyzed, and report developed	May 2015	
4. Appropriate outreach activities identified based on survey results	June 2015	

Activity 2. Establish and monitor demonstration/research sites **Budget: $364,833**

Evaluate and assess three alley cropping systems to be established at the University of Minnesota Southwest Research and Outreach Center in Lamberton, MN. These alley cropping systems are: 1) hybrid hazelnuts, 2) native willow, and 3) alder as the tree/shrub components, and native polyculture grasses and forbs (biomass and bee habitat), alfalfa (feed) and intermediate wheatgrass (grain and biomass) as the intercrops. Collect and assess data/ information on water quality, erosion rate, C sequestration, greenhouse gas emissions (nitrous oxide, carbon dioxide, methane), and biomass. Conduct and perform economic analysis.

Outcome	Completion Date
1. Three alley cropping replicated research/demonstration plots (12 plots) established covering at least six acres total; baseline data collected.	October 2014
2. Environmental parameters assessed including water quality, soil erosion, C sequestration, greenhouse gas emissions, and pollinators.	Annually from May to October
3. Economic data collected and analyzed based on project inputs and outputs (e.g., biomass)	Annually from May to October

Activity 3. Conduct outreach activities **Budget: $86,361**

Outreach activities will include workshops and field days at the research site targeting at least 250 farmers; develop web-based extension publications; conduct post survey to assess change in attitudes.

Outcome	Completion Date
1. Two on-site field day and two indoor-workshop conducted every year (a total of 12 events) at project site in Lamberton, MN. A total of at least 50-75 farmers, natural resource managers, policy makers and bankers attend each field day/workshop.	Annually beginning Year 2
2. At least one virtual field day conducted to share project results online to about 25-50 individuals belonging to our target audience.	Annually beginning Year 2
3. Web-based outreach materials (e.g., 3 factsheets and 2 popular papers, BMP) developed.	Annually
4. Post-survey to assess change in practices and behavior of farmers completed.	December 2017

III. PROJECT STRATEGY

A. *Project Team/Partners:*

The University of Minnesota will receive all of the funding and contribute time and effort to the project. Staff involved are: Diomy Zamora (Associate Extension Professor & Project Leader), Dean Current (Program Director & Co-Project Leader), Don Wyse (Professor), Charlie Blinn (Professor), Joe Magner (Research Professor – Hydrologist), Stan Hokanson (Professor), Rodney Venterea (Research Scientist- ARS), and Gary Wyatt (Extension Professor). Rural Advantage (a University of Minnesota NGO partner) will receive $9,000 to help project team connect with farmers for the outreach activities. Other collaborators will include The Nature Conservancy, Minnesota Department of Natural Resources, Soil and Water Conservation Districts, and the National Agroforestry Center. These partners will cooperate at no cost to the project.

B. Timeline Requirements

A four-year project length is needed to collect background information, establish research plantings, collect and analyze the data, develop Minnesota-based recommendations, conduct outreach activities, and prepare project summary reports. The first year of the project will be used to conduct the pre-survey and to establish the experiment. Years 2-4 will be used to conduct the research and outreach.

C. Long-Term Strategy and Future Funding Needs

Information collected will be used to further expand this research in other parts of MN. We will continue to seek funding from other funding agencies to carry this effort beyond the life of the project. Through working with other agencies, we will monitor impacts of the projects including land-use patterns and environmental and economic benefits that occurred as a result of the project.

2014 Detailed Project Budget

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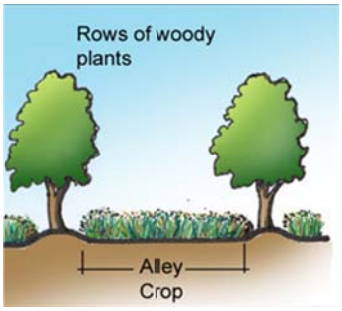
IV. Total ENTRF REQUEST BUDGET: $467,000; 4 YEARS

BUDGET ITEM	AMOUNT
Personnel:	
Salary-Fringe 1 (50% time) Grad Student for 4 yrs + 1 (25% time) Grad student for 2 yrs)	190,800
Student Hourly Labor @ $12/hr x 300 hrs/yr + FICA @ $266/year)	15,466
1/8 time Research Technician	19,349
6% time UMN -CINRAM Economist (Dean Current) Co-PI	22,298
UMN Hydrologist (Joe Magner) Co-PI	20,001
Contracts:	
Rural Advantage facilitate connection with farmers for outreach	9,000
Equipment/Tools/Supplies:	
Water Quality ($3000) and Soil Erosion devices (erosion pins @ $10/pc x 180 pcs = $1,800) + soil moisture probes @ $150/probe x 50 pcs ($7,500)	12,300
Willow Cuttings @ $0.25/cutting x 6000 cuttings + $150 S&H	1,650
Alder Cuttings @ $0.25/cutting x 6000 cuttings + $150 S&H	1,650
Hazelnut Bareroots Seedlings @ $5/seedlings x 800 seedlings	4,000
Gas Chamber for Greenhouse Gas Emissions analysis @$125/piece x 96 chambers	12,000
Seeds of polyculture grasses, intermediate wheatgrass, and alfalfa	1,500
Fertilizers ($1,500) + Video Cam for outreach ($1,000) + Lab and Field Suplies ($7,891)	10,391
Travel for Personnel	
Project Personnel Travels @ 2 trips/mo x 6 mo/year x 350 miles/trip x $0.565/mile + travel of Gary Wyatt @ 1 trip/month x 6 monhts/year x 100 miles/trip x $0.565/mile)	10,844
Grad Student Travels (3 trips/mo x 6 mo/year x 350 miles/trip x 0.565/mile	14,240
Travels to offer outreach activities (12 trips/year @350 miles/trip x $0.565/mile	7,119
Lodging + perdiem during research and outreach (16 days/yr x $80/day x $46/day perdiem x 16 days	7,308
Additional Budget Items	
Soil C Sequestration Analysis @ $15/sample x 156 samples/year x 4 years	9,360
Water Quality Analysis samples 96 samples x 3 collection per year $10/sample	11,520
Foliar Analysis @ 800 samples/year $5/sample for 3 yrs	12,000
GHG emissions samples @ 96 chambers x 4 gas samples per chamber = 384 samples per week @ $0.35 each for consumables = 134 x 32 weeks	17,204
Site Preparation Cost (Disking, herbicide application, planting)	6,000
Survery Costs for pre and post assessments (postage @$0.46/piece x 1500 = $690 x 2) + printing of survery questionainers + materials ($3,250/survery (pre and post)	8,000
Workshops/Field Days @ $10,000/workshop (promotion ($3,500), bus rental ($3,500), facility rentals for indoor workshops and portable potties ($3,000) x 3 years	30,000
Supplies for Outreach	6,000
2 Virtual Field days/year @ $2,500/vitrual field day (Promotion cost) x 2 years	5,000
4 webinars (hosting fee of webinar platform) @ $1000/yr x 2 years	2,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST	467,000

V. OTHER FUNDS

SOURCES OF FUNDS	Amount	Status
Other Non-State $ Being Applied to Project During Project Period	0	None
Other State $ Being Applied to Project During Project Period	0	None
In-Kind Service During Project Period (UMN Staff time)		
PI (Zamora) Salary + Fringe @ 4% time	12,843	
Co-PI (Wyatt) Salary + Fringe @ 4% time	14,972	
Other Staff (Blinn + Wyse + Hokanson) @ 1% time	19,842	
Remaining $ from Current ENRTF Appropriation (if applicable)		None
Funding History	0	
TOTAL OTHER FUNDS	**47,657**	



Alley Cropping Agroforestry System

Alley cropping is an agroforestry practice where agricultural or horticultural crops are grown in the alleyways between widely spaced rows of woody plants. Alley cropping can diversify farm income, increase crop production, improve landscape aesthetics, enhance wildlife habitat and provide protection and conservation benefits to crops. By combining annual and perennial crops that yield multiple products and profits at different times, a landowner can use available space, time and resources more effectively.

CRP Land

An example of an alley cropping system that can be employed for expiring CRP land that maintains environmental functions and expand economic benefits.

As continuous living cover for expiring CRP lands, alley cropping can:

- Reduce the rate of soil erosion
- Improve water quality
- Enhance wildlife and pollinator habitat
- Improve soil nutrient cycling & soil fertility
- Enhance carbon sequestration
- Reduce greenhouse gas emissions
- Enhance species diversity
- Diversify farm enterprises
- Serve as a source of biomass for energy

Hazelnut-pumkin alley cropping system for income diversification and environmental benefits in Wisconsin

Project Manager Qualifications

Dr. Diomy Zamora is an Associate Extension Professor/Extension Educator and Extension Forester at the University of Minnesota Extension focusing on agroforestry and biomass energy (bioenergy). Dr. Zamora is actively responsible for implementing Extension's agroforestry and bioenergy program with woodland owners, agricultural producers, Natural Resource Professionals as his target audience. He received his PhD in Forest Resources and Conservation at the School of Forest Resources and Conservation, University of Florida, Gainesville, Florida in 2005 specializing in Agroforestry. As an Agroforester by profession, Dr. Zamora promotes the establishment of different forms of agroforestry in Minnesota landscape for environmental and economic benefits. These agroforestry practices include alley cropping (planting of agricultural crops in alleys created by rows of shrubs/trees), silvopasture (managing trees + forage + livestock together as one unit for environmental and economic benefits), riparian forest buffers, windbreaks, and forest farming (farming non-timber forest products in the forests). Dr. Zamora is also implementing a number of bioenergy-related projects including the use of agroforestry practices to produce feedstock for energy. Having been with the University of Minnesota Extension for over seven years now, Dr. Zamora has developed, authored and published a number of peer-reviewed extension publications to reach his target audience about agroforestry and bioenergy production opportunities that provide both environmental and economic benefits to Minnesota.

Dr. Zamora teaches a course on "Agroforestry – Role in Watershed Management" at the Department of Forest Resources, College of Food Agriculture and Natural Resource Sciences, University of Minnesota. He also serves as a Principal Investigator and Co-PI of number of projects including the 2013 LCCMR funded project on "Enhancing Environmental and Economic Benefits of Woodland Grazing. Other projects being implemented include: 1) Assessing the use of willow shrub species on living snow designs to manage the damaging effects of salt (MnDOT Funded), 2) Educating Woodland and Agricultural Farm Owners in Minnesota , 3) A Decision Support Tool to Restore Impaired Waters (PCA-funded), and 4) Alley Cropping systems for Environmental and Economic Benefits (UMN Extension - RREA-Funded).