Environment and Natural Resources Trust Fund
2010 Request for Proposals (RFP)

LCCMR ID: 053-B1

Project Title:

Year-round Produce Production: Using Waste Heat and CO2

LCCMR 2010 Funding Priority:

B. Renewable Energy Related to Climate Change

Total Project Budget: $ $416,506

Proposed Project Time Period for the Funding Requested: 3 years, 2010 - 2013

Other Non-State Funds: $ $0

Summary:

Evaluate use of waste heat and CO2 from power and processing facilities to support local year-round production of fresh fruits and vegetables in Minnesota to enhance efficiency and CO2 capture.

Name: Donald Wyse

Sponsoring Organization: U of MN

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St. Paul MN 55108

Telephone Number: (612) 625-7064

Email: wysex001@umn.edu

Fax: (612) 625-1268

Web Address:

Location:

Region: Statewide

County Name: Statewide, Clay, Goodhue, Sherburne, St. Louis, Stearns

City / Township: Moorhead, Duluth, Becker, Red Wing

_____ Knowledge Base _____ Broad App. _____ Innovation

_____ Leverage _____ Outcomes

_____ Partnerships _____ Urgency _____ TOTAL

MAIN PROPOSAL

PROJECT TITLE: Year-round Produce Production: Using Waste Heat and CO_2

I. PROJECT STATEMENT - This project which falls under 2010 LCCMR Funding Priority G will explore how best to transform Minnesota's existing waste heat by-products and CO_2– from power plants and processing facilities – into a high value energy resource for local year-round production of fresh fruits and vegetables and a corresponding reduction in the carbon foot print of energy production in the state.

This project will examine opportunities to link local waste energy utilization with local food production by: 1) Identifying waste heat sources and CO_2 from Minnesota power and processing plants and assessing ways to most effectively deliver it to greenhouses that would support year round production of fresh fruit and vegetables; 2) determining and optimizing the energy needs – both heat, light and CO_2 – for greenhouse fruit and vegetable production in Minnesota; and 3) assessing the market potential for year round local fresh fruit and vegetable products in Minnesota.

This work will capture information needed to develop a template that – cooperating with American Crystal Sugar (ACS) as a test bed – will combine more efficient energy utilization and CO_2 sequestration with increased local food production to deliver new economic opportunities to Minnesota communities and consumers.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Identify and assess waste heat and CO_2 sources from power and processing plants and ways to deliver heat and CO_2 to support year round production of fresh fruits and vegetables in Minnesota - **Budget:** $135,364

1. Compile inventory of major waste heat and CO_2 sources statewide in Minnesota
2. Assess and characterize waste heat from a sugar processing plant
3. Assess greenhouse energy needs for year round fruit & vegetable production
4. Assess waste heat recovery system options and designs

Deliverable	Completion Date
1. Identify power and processing plants with potential waste heat and CO_2 available to support year-round fruit and vegetable production	October 2011
2. Intensive survey of waste heat sources from an (ACS) plant located in Moorhead, MN	October 2012
3. Estimate fuel costs to produce different fruits and vegetables in different greenhouse systems	December 2012
4. Assess alternatives to transfer available waste heat and CO_2 to meet greenhouse energy needs	December 2012

Result 2: Determine energy and CO_2 requirements for greenhouse local fruit and vegetable production in Minnesota - **Budget:** $139,530

1. Identify energy and lighting benchmarks for greenhouse production of fruits and vegetables in Minnesota
2. Determine quantities of CO_2, light, and heat greenhouse fruits and vegetables need from an alternative energy source to achieve maximum yield

Deliverable	Completion Date
1. Response of 5 vegetable species to temperature, light and CO_2 to determine energy and CO_2 enrichment needs for a greenhouse production facility adjacent to the ACS facility in Moorhead, MN	February 2012
2. Modeling of yield and profitability profiles for greenhouse production facility supported by waste heat	February 2013
3. Photosynthesis response curves to light intensity, temperature and carbon dioxide will be developed	February 2013

Result 3: Assess market potential for year round local fresh fruit and vegetable production in Minnesota - **Budget:** $141,612

1. Consumer survey of greenhouse fruit and vegetable preferences
2. Experimental auction to determine price points of selected greenhouse crops

Deliverable	Completion Date
1. Identify consumer attitudes and preferences for specific fruits and vegetables including importance of point of production, quality and labeling	December 2012
2. Determine consumer price points for locally produced greenhouse crops	December 2012

III. PROJECT STRATEGY

A. Project Team/Partners

- John Erwin, Professor, Greenhouse Crop and Floriculture Physiology and Extension, UMN Department of Horticultural Science – Role – responsible for Result 2 deliverables
- Kevin Janni Professor and Extension Engineer, Bioproducts and Biosystems Engineering, UMN – Role – Lead efforts on waste heat assessment work for Result 1
- Linda Kingery, Executive Director, UM Northwest Regional Sustainable Development Partnerships – Role - connect with business groups (e.g., ACS) and engage local foods advocates in developing and using market research data to help replicate this model
- Tom Kuehn Professor, Mechanical Engineering, UMN – Role – lead assessment and thermodynamic analysis of waste heat recovery system options
- Lissa Pawlisch Clean Energy Resource Teams Coordinator, UM Regional Sustainable Development Partnerships – Role - Inventory waste heat source facilities and identify locations with potential to support year-round greenhouse fruit and vegetable production.
- Don Wyse, Professor, Department of Agronomy and Plant Genetics, UMN – Role – Overall project lead and coordinator
- Chengyan Yue Assistant Professor, Department of Horticultural Science and Applied Economics, Bachman Endowed Chair of Horticultural Marketing, UMN – Role - responsible for consumer survey and auction design and results (Result 3 deliverables)
- American Crystal Sugar – Role – partner in determining waste heat energy availability at ACS Moorhead, MN facility and developing feasibility of use/market acceptance studies

B. Timeline Requirements - Project timeline requirements are based on the expected amount of time needed to complete each specified result as effectively and efficiently as possible. It is expected that this project will be completed by June 2013.

C. Long-Term Strategy – This proposal should be seen as series of key steps in assessing the potential for use of waste heat and CO_2 in year-round local fruit and vegetable production in Minnesota. If sufficient potential is identified with this work, it is expected that future investments would be required in infrastructure and business development.

Project Budget

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

Attach budget, in MS-EXCEL format, to your "2010 LCCMR Proposal Submit Form".

(1-page limit, single-sided, 11 pt. font minimum. Retain bold text and delete all instructions typed in italics. ***Add or delete rows as necessary.*** *If a category is not applicable you may write "N/A" , leave it blank, or delete the row.)*

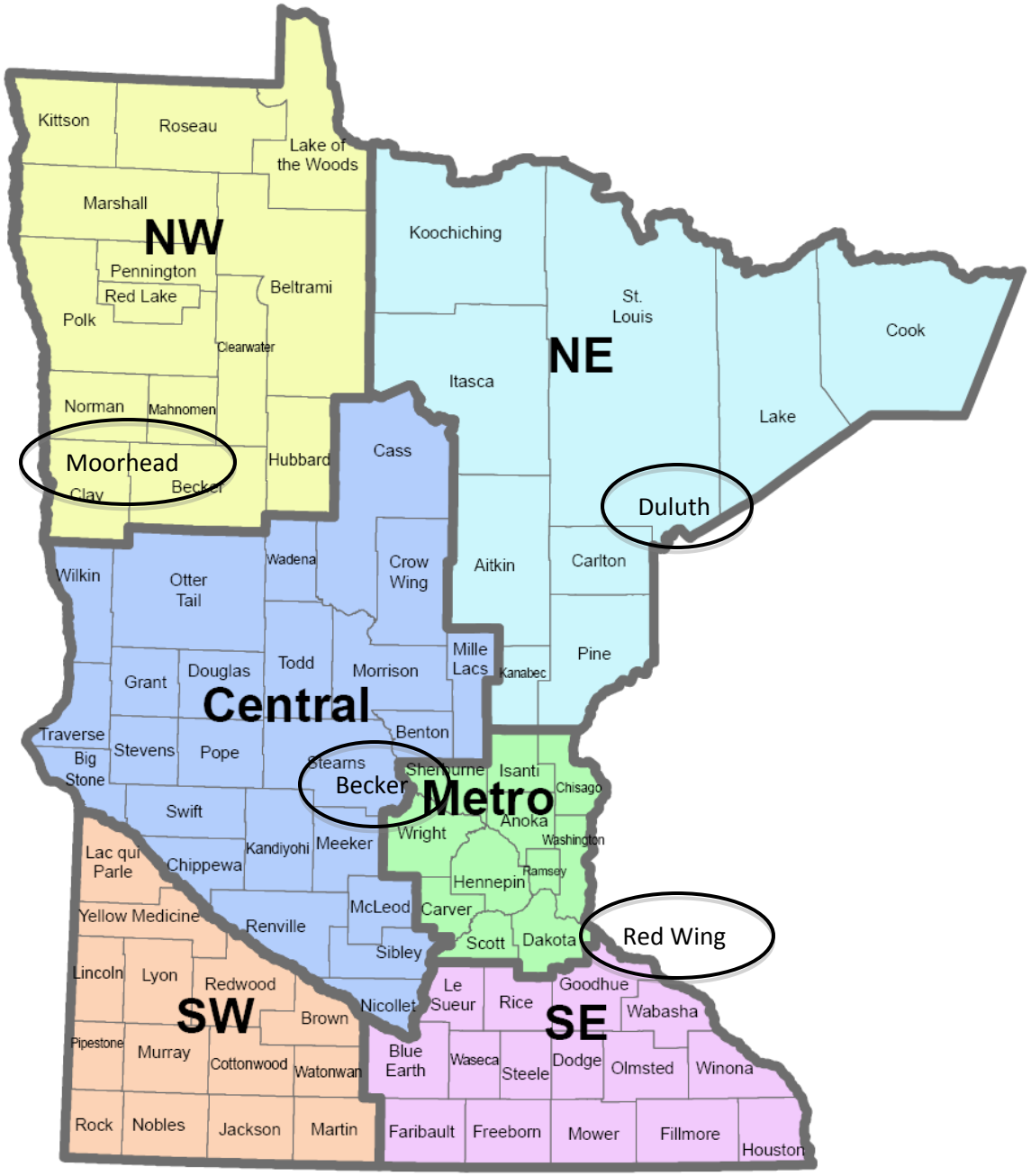
IV. TOTAL PROJECT REQUEST BUDGET (*[Insert # of years for project]* years)

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 13)*	**AMOUNT**
Personnel:	$ 360,306
3 Undergraduate Students; 1200 hrs; $10/hr; $12,000 salary; x 3 years = $108,000	
1 Research Fellow; 50% time; $24,000 salary; $7,752 fringe [32.3%]; x 3 years = $95,256	
3 Graduate Student; 25% time; $10,155 salary; $7,295 fringe; x 3 years = $157,050	
Contracts:	N/A
Equipment/Tools/Supplies:	$ 43,000
Waste heat source assessment supplies $5,000	
Greenhouse and growth chamber rental and lab supplies $18,000	
Market research analysis, services and supplies $20,000	
Acquisition (Fee Title or Permanent Easements):	N/A
Travel:	$ 13,200
In-state travel; 8,000 mi/year; $0.55/mi; x 3 years	
Additional Budget Items:	N/A
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 416,506

V. OTHER FUNDS

SOURCE OF FUNDS	**AMOUNT**	**Status**
Other Non-State $ Being Applied to Project During Project Period:	N/A	
Other State $ Being Applied to Project During Project Period:	N/A	
In-kind Services During Project Period:	$ 5,057	
Donald Wyse, 1% effort, $4,057 [Salary and fringe @32.3%] x 3 years		
Remaining $ from Current Trust Fund Appropriation (if applicable):	N/A	
Funding History:	None	

Minnesota (By Region)



BIOGRAPHICAL SKETCH

DONALD L. WYSE
Department of Agronomy and Plant Genetics
University of Minnesota, St. Paul, MN 55108
Phone: 612-625-7064, E-mail: wysex001@umn.edu

EDUCATIONAL HISTORY
The Ohio State University, 1970, B.S., Agronomy
Michigan State University, 1972, M.S., Crop Science (Weed Science)
Michigan State University, 1974, Ph.D., Crop Science (Weed Science)

PROFESSIONAL POSITIONS
Founding Director, Minnesota Institute for Sustainable Agriculture, Univ. of Minnesota, 1992-2000
Co-director, Center for Integrated Natural Resources and Agricultural Management, 1995-present
Professor, Dept. of Agronomy and Plant Genetics, University of Minnesota, 1986-present
Associate Professor, Dept. of Agronomy/Plant Genetics, University of Minnesota, 1980-1986
Assistant Professor, Dept. of Agronomy and Plant Genetics, University of Minnesota, 1974-1980

PROFESSIONAL ORGANIZATIONS AND HONOR SOCIETIES
North Central Weed Science Society
Weed Science Society of America
Sigma XI
Plant Physiology

HONORS AND AWARDS
Co-author of the Outstanding Paper published in Weed Science, 1987
Weed Science Society of America Outstanding Young Weed Scientist, 1987
Outstanding Teacher Award in the College of Agriculture, 1988
Weed Science Society of America Outstanding Teacher Award, 1991
Outstanding Faculty Performance Northrup King Award, 1991
CIBA-GEIGY Award for Outstanding Achievement in Agriculture, 1991

TEACHING EXPERIENCE
My responsibilities include teaching and supervising graduate student research in weed science and cropping systems.
AGRO 4503 (3 credits), Biology, Ecology and Management of Invasive Plants

RESEARCH AND MANAGEMENT EXPERIENCE
Donald Wyse is a Professor in the Department of Agronomy and Plant Genetics at the University of Minnesota, St. Paul, where he teaches and conducts research in weed management, cropping system development, and plant breeding and selection. His research concentrates on biological weed management, development of multifunctional agricultural systems, perennial crop breeding, and legume and grass seed production systems. He has focused his research efforts on the development of perennial cropping systems, cover crop systems, biomass prairie polycultures, and has studied their impact on soil and water quality. He has lead several multi-disciplinary research teams composed of university faculty and scientists from both state and federal agencies. He has experience in managing large multi year grants. Dr. Wyse was the founding Director of the Minnesota Institute for Sustainable Agriculture and currently serves as Co-director of the Center for Integrated Natural Resources and Agricultural Management at the University of Minnesota. Recent activities of the Center have led to the development of the Mississippi River—Green Land, Blue Water Initiative that includes universities, state and federal agencies, and NGO's that have organized to deal with the landscape issues that impact water quality in the Mississippi River and Great Lakes Basin. He was one of the founding organizers of the Midwest Cover Crops Council and is an active member of the Executive Committee.