2015 Strategic Plan — A Guide for Our Future
West Central Research and Outreach Center
University of Minnesota
December, 2015
Foreword

The West Central Experiment Station, forerunner of the West Central Research and Outreach Center (WCROC), was established in 1910. For over 100 years, this institution has been conducting research and education around agricultural practices. The WCROC and its predecessor have played and will continue to play an integral part in the research and education missions of the University of Minnesota’s College of Food, Agricultural and Natural Resource Sciences (CFANS). We hope that the WCROC will earn an ever larger role in helping the College develop and implement agricultural technology into the future. However, to realize this hope, we must occasionally pause to consider our assets, our weaknesses, and the realities of the world around us. And, use this information to formulate possibilities for the future. These reflections and deliberations help us chart a path for our work into the future. In other words, develop a strategic plan.

This document represents an updating of WCROC’s first strategic plan developed in 2013. This plan is the collective work of the faculty and project leaders at WCROC in collaboration with the WCROC Advisory Committee. The plan charts small and large steps we would like to take to advance our mission. As you read the plan, please consider how you can help us, in large or small ways, to achieve the goals set out in this plan. I encourage you to share your thoughts, ideas, suggestions, and critiques with any of the people involved in developing this plan.

Thank you for your interest in the West Central Research and Outreach Center!

Lee J. Johnston
Director of Operations
December, 2015

Methodology

In 2012, faculty and project leaders at the West Central Research and Outreach Center determined that the Center needed a plan to help guide investments of human and financial capital in ways that would benefit the Center’s stakeholders and the Center. Our first step was to update the mission statement for the Center. Project leaders and faculty worked cooperatively to develop and embrace a new mission statement which appears below. This revised mission statement set the boundaries for our planning activities.

Throughout 2012 and 2013, we held two meetings with stakeholders to learn their views of the Center’s strengths and weaknesses. We also asked them for guidance on future directions for activities at the Center. With this input in hand, we held meetings which included faculty, project leaders, and WCROC Advisory Committee members to hone the input and meld it with our thoughts and aspirations. The expert help of Ms. Sue Haglin (Insight Training, Alexandria, MN) was invaluable in guiding us through this process. Our goal was to establish a focused, short action plan for each discipline area (Crops,
Dairy, Horticulture, Renewable Energy, Swine) at the Center. In addition, we identified some strategic needs that spanned all disciplines at the Center. So, we developed a one-page action plan to address needs in Capital Planning and Communications.

Since April 2013, project leaders and faculty have been working to execute the plans developed in this process. During the past two years, many, but not all, of the tasks and goals outlined in the 2013 Strategic Plan have been realized. Now it is time to set new goals and targets for the coming 2 to 3 years. The following pages outline the tasks and goals we would like to complete in the coming years. This plan is malleable and a “work in progress”.

People involved in developing this plan

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<td>Mr. Grant Anderson, Swine and crops producer</td>
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<td>Dr. Rob Gardner, Renewable Energy Scientist (Program Leader)</td>
<td>Mr. Paul Anderson, Crops producer</td>
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<td>Dr. Brad Heins, Dairy Scientist (Program Leader)</td>
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<td>Dr. Lee Johnston, Swine Scientist (Program Leader and Center Director of Operations)</td>
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<td>Dr. Yuzhi Li, Swine Scientist (Program Leader)</td>
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<td>Mr. Tim Swedberg, Nursery owner/operator</td>
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<td>Ms. Terry VanDerPol, Beef producer</td>
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<td>Ms. Suzanne Vold, Dairy producer</td>
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WCROC Strategic Plan: Across Disciplines

MISSION

WCROC provides research-based innovation and outreach by vigorously pursuing opportunities for agricultural producers and rural citizens while identifying and responding to emerging trends, developing dynamic solutions, and offering active learning experiences.

5-YEAR STRATEGIES

- Create and implement a fund development plan to enhance all WCROC programs that includes base, grant, and private funding.
- Develop and implement a 5-year capital plan to update and remodel our current facilities and establish new facilities.
- Develop and implement a plan to modernize outreach activities and learning experiences.
- Identify permanent funding for student internships.
- Create and implement a robust communications plan that includes the following aspects: Website, social media, audience segmentation, marketing, and metrics.

2015 - 2017 PRIORITIES / BOLD STEPS

- Create a fund development plan to enhance all WCROC programs. (Lee, Esther, Steve)
- Develop a 5-year capital plan for our facilities updates/remodeling. (Lee, Program Leaders)
- Advance renovations of the maintenance shop to modern building codes. (Tony, Lee)
- Develop a plan to modernize outreach activities and learning experiences (Esther, Program Leaders)
- Identify internship funding sources. (All Program Leaders)
- Achieve our 2015 Program Plans. (All Program Leaders)
WCROC STRATEGIC PLAN:
CAPITAL ASSETS

Overall Champion is: **Lee Johnston**

DEVELOPING THE 21ST CENTURY AGRICULTURAL EXPERIMENT STATION - The primary goal of the Capital Plan is to provide and maintain capital assets required to meet the mission and strategic objectives of the West Central Research and Outreach Center and to provide the region, state, and nation with valued, leading-edge agricultural and rural research and education. A secondary goal is to continue being a regional resource for citizens of Greater Minnesota.

**TWO YEAR FOCUS**

In 2015 through 2017, a WCROC Campus Master Plan will be refined. The WCROC Campus Master Plan including a Six-Year Capital Plan will be submitted to the University for approval. From the Six-Year Plan, an Annual Capital Request will be made to the University to support one major capital project through a legislative request. Additional capital asset upgrades including new construction, remodel, repair and maintenance, and asset acquisition will be made through internal and sponsored funding.

**KEY MEASUREMENTS/OBJECTIVES – 2015 through 2017**

1. A WCROC Campus Master Plan including a six-year capital request will be developed.
2. Approval of the WCROC Campus Master Plan will be requested from the College and University.
3. An Annual Capital Request will be submitted to the college and University administration.
4. $1 million of external funding will be developed as a match for the Annual Capital Request.
5. The Annual Capital Request including the external funding match (item 4) will total over $4 million.
6. The final phases of the Farm Shop Remodeling Project will be fully funded and completed.
7. Designs will be completed for new dairy and feed mill facilities as well as the horticulture pavilion.
8. Agricultural land purchases and major capital maintenance projects including funding options will be identified in the campus master plan.
9. Pavement will be updated across the entire WCROC campus.
1. A WCROC campus planning charrette will be held with program leaders, Director, and the ROC Head.
2. By January 2017, the Advisory Council, CFANS Deans’ Council, and CPPM will review and provide feedback on the WCROC Campus Master Plan and the Six-Year Capital Plan drafts.
3. The pre-design process for the dairy facilities, feed mill, and horticulture pavilion will begin by December 2015 and be completed by June 2016.
4. A completed WCROC Campus Master Plan will be submitted to CFANS, CPPM, and the University Regents for approval by December 2016.
5. As part of the Master Plan, two major capital requests will be developed including: (See attached)
   a. Horticulture Research and Display Garden Pavilion
   b. Midwest Organic Dairy Production Research and Education Complex
6. Resurfacing the WCROC asphalt roads will be completed by November 2017.
7. A small wind turbine and over 70 kW of solar photo voltaic power will be installed by December 2017.
8. A finance plan for the large wind turbine repair and replacement will be developed by December 2015.
ADDENDUM TO CAPITAL ASSETS PLAN: MAJOR CAPITAL REQUESTS

Project 1: Horticulture Research and Display Garden Pavilion
The construction of a Garden Pavilion on the west end of the current WCROC Horticulture Display Garden would create new opportunities for outreach and education in the Garden and for the WCROC. Numerous activities currently held in the Garden lack adequate resources, space and shelter. Since there are no other venues like the proposed Pavilion in the region, we anticipate it would be used for educational events and activities, family and community gatherings, a site for weddings and receptions, and a venue for music, arts and cultural performances. A Pavilion would enhance our current events (such as Horticulture Night, Dinner in the Garden, and our monthly “Come Grow with Us” education series) as well as expand our options for adding new programs and activities that are not feasible with our existing facilities. The Pavilion would include both indoor and outdoor seating accommodations for approximately 125 guests, along with indoor restrooms, and a food serving area. The Pavilion would be available for educational purposes, which includes a counter space for displays and demonstrations, as well as a wall designated for Power Point presentations. While keeping within the Prairie School of Architecture and complementing the existing structure of the Pomme de Terre Overlook, the Pavilion should offer a sense of openness that allows visitors to enjoy the beauty of the Garden.

A Garden Pavilion Fund has already been established through the U of MN Foundation. Long-term garden donors have contributed to the initial stages of this project. The WCROC Horticulture Staff, in consultation with the WCROC Horticulture Advisory Committee, have identified possible concepts and ideas to incorporate into the Pavilion. A pre-design document has been developed which will guide construction and financing of the Pavilion. Discussions are underway with the CFANS Fund Development Office to establish and implement a fund development plan to finance the pavilion.

Desired Features of the Garden Pavilion, Horticulture Display Garden, and the surrounding grounds:

1. Garden Pavilion to include indoor and outdoor seating accommodations for approximately 125 guests.
2. The Pavilion would also include a serving area complete with counter space for educational displays and demonstrations, indoor restrooms, and serving area.
3. Restrooms at the east end of the Garden, near the Children’s Garden area. Many events and activities are held at the east end of the Garden; numerous visitors, class attendees, children and volunteers visit the Garden everyday throughout the growing season and would benefit from a permanent restroom facility.
4. Make the Garden more handicapped and limited mobility accessible by installing hard surfaced paths, raised beds, and handicap accessible and ADA compliant ramp.
5. Install automated irrigation in key Garden areas.
6. New greenhouse growing space and updating of existing greenhouse and storage facilities.
7. Two interpretive kiosks with touch screen computers, one at the east end and the other at the west end, would allow visitors to learn more about what it in the Garden as well as the other research and projects conducted at the WCROC.

8. Develop the concept of the Market Garden on the southeast end of the Garden. With an increase in demand for fresh local produce, and the need for education on how to grow healthy foods, creating a Market Garden offers a way for us to demonstrate how to grow produce. The Market Garden is part of the Master Plan, and would likely involve groups such as Morris Healthy Eating Initiative, UMM Garden Club and the area schools.

9. Interpretive signage at all key areas on the WCROC grounds. This will help to integrate the Garden with the rest of the farm, giving visitors a more seamless transition from one area to another.

10. Provide lighting in key Garden areas and parking lots. With present and future activities taking place later in the day, having adequate lighting is an important safety feature.

11. Permanent shelter for registration at horticulture educational events.

12. Restore current pond west of swine nursery. As this area gets closer to the Pomme de Terre Overlook restored native prairie, we need to make this area aesthetically pleasing.

13. IT
   a. Supervised Control and Data Acquisition/Storage System
   b. Install fiber lines
   c. Telephone system upgrade
   d. Data server


15. Expand current parking lot.

16. Expand and resurface current parking lot

17. Repair kitchen/floor/floor coverings – refurbish guest house for student interns, visiting scientists, and U of M researchers visiting WCROC
Project 2: Midwest Organic Dairy Research and Education Complex

The West Central Research and Outreach Center (WCROC) has provided the dairy industry with advancements in the areas of livestock health, nutrition, crossbreeding and reproduction. These advancements have contributed to efficient food production in the United States. Dairy research began in 1915 with Holstein and Guernsey cattle, which offered educational outreach opportunities for farmers in west central Minnesota. Currently, the 250-cow dairy is the only certified organic dairy at a land grant institution in the Midwest and this provides an important source of insight for conventional and organic dairy producers. With an increasing number of organic dairy producers in the Upper Midwest, the need for practical, innovative, and research-based solutions for organic production systems became evident. Our decision to transition a portion of the dairy herd and supporting land at WCROC to an organic production system provides an opportunity to offer education and outreach and set new directions in research and extension. The WCROC dairy program has the only side-by-side comparison of organic and conventional systems in the United States. Unique capacities such as these have helped the University of Minnesota support a strong and growing dairy and food processing industry. Currently, the State of Minnesota ranks eighth in milk production and exports. At the farm level, the industry employs 9,700 people and has an economic impact of $3.1 billion (MN Dept. of Ag., 2015). New investments in research infrastructure are critically needed to retain and grow this leading Minnesota industry.

One of the goals of the dairy program at the WCROC is to serve the research-based information needs of the moderate sized dairy farm, with emphasis on reduced input systems. The current dairy facilities were completed in 1972, and the aging research facilities are inadequate to address the future research and educational needs of the dairy industry. Therefore, long-term investment in dairy research facilities is important to the sustainability of the dairy industry in the Upper Midwest. These facilities must address issues related to efficient use of energy, animal care and well-being, and approaches to minimize impacts of dairy production on the environment while reducing the carbon footprint of the system. These are critical issues for dairy farmers as well as many of the global food companies headquartered in Minnesota. The WCROC dairy program is ideally positioned to address these critical agricultural issues and addition of new dairy facilities will greatly enhance these capabilities and impacts. Existing programs in renewable energy and crop production at WCROC enable cross-discipline research and education programs that address the multi-faceted challenges facing modern dairy producers and the dairy industry.

The dairy research and outreach efforts at the WCROC enjoy active support of farmers, non-governmental organizations, and others within the dairy industry. Each year, we welcome hundreds of guests, students, visiting scholars, and industry professionals to our facility for tours and presentations.
The proposed organic dairy research complex will include a milking parlor expansion to meet the demand of emerging technologies in the dairy industry. We will also expand the use of energy efficient technologies to the dairy and corresponding feed facilities. The WCROC perhaps provides the only location in the U.S. and is one of only a few in the world with such a combination of novel renewable energy systems in agricultural production settings. Further development of the facility will contribute to University of Minnesota efforts to educate consumers about dairy, food, and agricultural production systems. These new capabilities will greatly enhance our ability to provide cutting-edge educational opportunities for agricultural producers and rural citizens.

There are many funding models that could build and upgrade the facility as low-cost and efficiently as possible. The dairy industry in Minnesota is very supportive of the research and extension at the WCROC.

**Desired Features of the Dairy Complex**

**Phase 1:**
1. New milking parlor and holding area with the ability to milk 250 cows twice daily fast and efficiently.
2. State-of-the-art Precision Technology Systems in the milking parlor to monitor cow mastitis, pregnancy, ketosis, and other milk health parameters
3. Automated body weight system and cow-sort system as cows exit the milking parlor
4. Small holding facility with 25 to 40-headlocks for cattle to be used for breeding and herd health checks.
5. Upgrade conventional feed mill and include a dedicated organic feed mill with feed storage and dedicated facilities for storing organically-certified grains and feed ingredients. This facility must be connected to the existing grain dryer system and insure segregation of organically-certified grains.
6. Expand the use of small-scale renewable energy and energy efficient technologies to the dairy and feed facilities.
7. Install organic dairy interpretive kiosks with touch screen computers near new dairy complex.
8. Preparation space for research, tours, and to provide hands-on training to graduate and undergraduate students
9. Safe environment for students, staff and animals

**Phase 2:**
1. A new compost or free-stall barn to house cattle in the winter with a GrowSafe System to monitor feed intake, residual feed intake, and dairy efficiency of cows and heifers
2. Re-purpose old dairy tie-stall barn to include 4 Förster Technik automatic calf feeders, pasteurizer, bulk tank for waste milk for calf feeding research.

3. Extend and concrete silage pad, resurface asphalt next to silage pad, chip seal asphalt on east side of farm

4. Expand the use of small-scale renewable energy and energy efficient technologies to the dairy and feed facilities.
   a. Install a small-scale wind turbine and solar PV for the dairy
   b. Install a solar thermal system for the dairy and instrument facilities to collect load data and to automate controls
   c. Incorporate thermal and electrical energy storage systems
   d. Build a facility to serve as a thermal and electrical energy storage lab for renewable systems associated with the dairy complex.

5. Install integrated backup energy generation system based on renewable sources.

6. IT
   a. Supervised Control and Data Acquisition / Storage System
   b. Install fiber lines to research buildings
   c. Telephone system upgrade
   d. Data server

7. Repair kitchen/floor/floor coverings – refurbish guest house for student interns, visiting scientists, and U of M researchers visiting WCROC.

8. Enable dispensing of hydrogen and ammonia as a fuel for tractors, trucks, generators, and other farm vehicles
WCROC Program Plan

Program Plan for: **Communications**

Overall Champion: **Esther Jordan** with input from Program Leaders

Primary goals include: Enhance the mission and vision of the WCROC by promoting the high quality work and extensive resources available at the WCROC. Consistently provide communication to internal and external audiences for each program. Develop marketing strategies that solidify our presence amongst stakeholders, producers, and general public.

**ONE YEAR FOCUS**

- Identify marketing opportunities within the region and state where we can share WCROC outcomes and successes.
- Maintain a non-static web presence through the WCROC website.
- Offer communication support to the WCROC and all program areas for events, newsletters, mailings, press releases, etc.
- Promote WCROC research, outreach and activities through popular press, social media and other networks.

**KEY MEASUREMENTS/OBJECTIVES**

- Establish a schedule for visiting with program leaders to update website content. Review and update content on WCROC website annually. Maintain website.
- Assist program leaders with promotion of program(s) and event communications to increase attendance and/or external awareness.
- Maintain consistent branding with all communications that reflects the mission and vision of the WCROC, CFANS, and the U of MN.

**KEY STRATEGIES and ACTION STEPS**

- Use analytics to assess WCROC website pages. Make formatting and site content changes as necessary based on audience views and page clicks.
- Transition WCROC paper newsletter to an eNews format. Identify internal and external audiences.
- Determine audience segmentation and create communication strategies for events and/or programs. Offer communication tools to program leaders for maximizing audience reach, consistent messaging, and polished presentations.
- Provide communication strategies for reaching regional and statewide audiences.
- Develop and implement methods for assessing impacts of communication strategies.
WCROC Program Plan

Program Plan for: Cropping Systems

Overall Champion: Curt Reese

TWO YEAR FOCUS

- In 2016/17 the crops program will focus on weed management and crop productivity in a 6-year reduced tillage organic rotational cropping system that utilizes manure as its nutrient source. This system will be contrasted with a 6-year aggressive tillage organic rotational cropping system. In 2016, we will continue to examine tile line nitrate movement associated with these cropping systems.

- We will assist Dr. Brad Heins with start of the “Integrated crops and livestock in a systems approach to enhance organic farm stability, safety and resilience” (ICL) project.

- Develop research goals during the time of transition from George Nelson to the new Crops Coordinator.

- We will continue supporting research plots at WCROC and implement an organic corn performance trial.

- Cooperate with Extension and the Organic Dairy project with field days, outreach activities and research.

- Increase attendance and quality of Center Day by focusing event on specific targeted audiences.

- Increase our organic cropping system awareness to stakeholders and determine research needs.

- Develop an equipment maintenance and replacement plan to inform purchase decisions.

KEY MEASUREMENTS/OBJECTIVES

- Measure differences in weed pressure associated with reduced tillage and aggressive tillage organic cropping systems in 2016/17.

- Measure differences in tile line nitrate concentration associated with reduced tillage and aggressive tillage organic cropping systems, late 2015 through 2017.

- Yields and weed control data will be collected for the cash crop and data will be collected for the ICL project.

- Discuss and develop a more specific plan for 2017 and 2018 which includes research areas vital to stakeholders within the region, state, and University.

- Perform organic corn performance trial and determine the usefulness of the data. This will help increase our awareness of our organic cropping system.

- Work with Extension staff for the tillage field day and other events.

- Count visitors at field day and get feedback from participants to determine what they want to learn. I would like to see at least 100 participants. Plan topics and have demonstration areas for speakers. An example it to inoculate Goss’s wilt bacteria on corn for a presentation of corn disease.
KEY STRATEGIES and ACTION STEPS

- A 6-year rotation encompassing both cropping systems started in 2012 will continue. The cropping systems will require refinement and procedural change as time progresses, due to climate and pest variability. The ultimate goal is to evaluate if productivity can be maintained using mostly crop competition verses mostly tillage for organic weed management.
- Refine protocols for field scale organic grain and forage yield determination. This will need to be done over a long period due to differences in cropping years. Staff will attend organic field days and educational events to increase our collective knowledge of organic practices.
- Develop field for ICL project.
- Work with organic seed producers, farmers, and stakeholders on an organic corn performance trial.
- Work with Extension, staff and project leaders to promote center day and evaluate if this event is worthwhile.
- Research and work with staff to develop an equipment maintenance and replacement plan.
- Work with Esther to update the crops webpage.

Outcomes

- Data collection of energy requirements and productivity of energy-optimized cropping systems will be included in the Greening of Agriculture IREE Grant deliverables.
- Refinement in our organic farming practices will lead to increased organic production with less input. This will occur over a long time and will vary from year to year based on weather.
- Activities such as doing an organic corn performance trial, increasing field day quality and attendance, and working with Extension on projects will increase our public awareness to our stakeholders.
WCROC Program Plan

Program Plan for: **DAIRY**

Overall Champion: **Brad Heins** with assistance from many other faculty from St. Paul campus and Extension

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**TWO YEAR FOCUS**

The focus for the dairy program is solidified for the next 2 to 4 years because of 2 large multi-year USDA-OREI grants. The research will focus on the organic milking cows and dairy steers, with a few small calf studies. We will also focus on precision technologies for organic and grazing dairy cattle to improve fertility, health, and well-being of cattle. In 2015 and 2016, the research focus will also include on-farm research. Extension efforts will include many field days, workshops, and online presentations and articles.

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**KEY MEASUREMENTS/OBJECTIVES**

- We will publish 4 articles from the research completed at WCROC during 2015.
- Graduate student progress will be made on the organic research topics and successful master’s completion in early 2016.
- We will continue the WCROC Organic dairy day program. We will also host organic field days on organic dairy farms.
- I will continue to apply for grants for organic and conventional dairy funding, and calf and heifer research, as well as precision technology and welfare of grazing animals will be topics for funding.
- Continue to efficiently manage the dairy unit and to explore alternative feed sources and bedding sources to improve the financial performance of the dairy.

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**KEY STRATEGIES and ACTION STEPS**

- Develop a pre-design and finance strategy to update the dairy facility at West Central Research and Outreach Center
- Continue to develop an effective extension and outreach plan for the Organic dairy program, through new and effective means of communication.
- Effectively manage OREI projects and continue collaborations between WCROC and St. Paul campus faculty, as well as collaborators on both OREI projects.
- Increase communication efforts of the dairy program through newsletters and an increased online presence.
WCROC Program Plan

Program Plan for: Horticulture

Overall Champion: Steve Poppe with assistance from Esther Jordan and Horticulture Advisory Committee

TWO YEAR FOCUS

- Fine tune our educational offerings with a focus on youth and young adults. Increase and expand this audience.
- Develop and recommend future plans for the Horticulture Display Garden in the areas of Marketing and Fund Development.
- Expand the level of involvement from volunteers, Master Gardeners and young adults.
- Move forward with small fruit and vegetable research in coordination with local foods initiative.
- Offer increased educational interpretation throughout the Garden.

KEY MEASUREMENTS/OBJECTIVES

- Increase the number of donor contributions, both to the General Fund and to elements of the updated Master Plan.
- Successfully apply for and receive grant funding for small fruit research.
- Increase the number of younger volunteers.
- Offer education classes 10 months out of the year. Review evaluations for ideas on upcoming topics.
- Have increased involvement from regional Master Gardeners.

KEY STRATEGIES and ACTION STEPS

- Continue to recruit new Garden volunteers with age and job diversification.
- Share the updated Horticulture Garden Master Plan with interested citizens.
- Review, prioritize and implement marketing plan from HBH Consultants.
- Partner and collaborate with educators and key figures for children’s educational programming.
- Work with CFANS Development Officer(s) to establish fund development plans for specialty projects and to foster donor relations.
- Secure funding for future enhancement of the Garden in accordance with the Horticulture Display Garden Master Plan.
- Collaborate with other U of MN departments and centers in pursuing potential research projects.
- Create a plan for improved interpretation in the Garden.
WCROC Program Plan

Program Plan for: **Renewable Energy**

Overall Champions: **Michael Reese and Rob Gardner**

The primary goals of this plan are to conduct high quality research and impactful outreach that will lead to the reduction of fossil energy consumption and the carbon foot-print of production agriculture in Minnesota and across the nation.

**TWO YEAR FOCUS**

In 2015 through 2017, renewable energy and energy efficiency research will focus on improving energy systems within core agricultural enterprises located at West Central Research and Outreach Center including crop, horticulture, dairy, and swine production. The information generated will have direct and indirect applications for agricultural producers as well as other businesses and individuals. Energy audits will continue to be performed to quantify energy consumption. Energy-optimized systems will be developed and evaluated within dairy, swine, and horticulture production facilities with the goal of improving long-term efficiency and profitability of Minnesota farms. Crop production efforts will focus on fertilizers made from renewable and sustainable resources; transportation energy used in tractors and trucks; and energy consumed in processing, drying, ventilating, and conveying grains and feed.

**KEY MEASUREMENTS/OBJECTIVES – 2015 through 2017**

1. The WCROC renewable energy program will strive to be a world-renowned Center of Excellence for agricultural energy research and programming. Staff will strive for high levels of excellence and professionalism. Research facilities will reflect this high standard by being well-maintained and clean. Colleagues, stakeholders, and guests will be treated with a high level of respect.
2. Energy audits will be completed on the WCROC crop, dairy, and swine production enterprises.
3. Energy-optimized systems will be designed, developed, and installed in WCROC dairy and swine facilities.
4. Baseline and energy-optimized life cycle assessments will be performed on crop, dairy, and swine production enterprises. WCROC horticulture facilities will be monitored for energy consumption.
5. Novel renewable fertilizer production processes will be scaled-up from lab systems, tested, and refined for commercial use.
6. The Gardner Research Group lab will be assembled and data will be collected at the USDA-ARS North Central Soils Conservation Research Lab.
7. One graduate student per year will join the Gardner Research Group to reach a steady state of 3 to 4 graduate students at any one time.
8. A six-year capital plan will be developed for the renewable energy program which will include energy-optimized systems for crop, dairy, horticulture, and swine production.
enterprises; wind turbine upgrades, renewable hydrogen and ammonia pilot plant
maintenance and additions; and scale-up testing infrastructure for algal / microbial
biofuels and bio-chemicals research.

9. Funding will be developed through grants and other mechanisms to support research
and outreach efforts including capital construction and maintenance.

10. The renewable energy program will continue to build upon inter- and multi-
disciplinary research efforts within and outside the University of Minnesota.

11. The renewable energy program will develop more effective and impactful outreach to
farmers, agricultural and energy professionals, and University of Minnesota students.

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**KEY STRATEGIES and ACTION STEPS – 2015 through 2017**

1. Data from crop, dairy, and swine energy audits will be analyzed and a comprehensive
report will be completed. (Eric and Kirsten)

2. Data from the renewable hydrogen and ammonia pilot plant energy audit will be
analyzed and a comprehensive report will be completed. (Mike and Cory)

3. Life cycle assessments on current crop, dairy, and swine enterprise energy use will be
completed. (Joel)

4. A small wind turbine, solar photovoltaic, and solar thermal system will be installed and
tested at the WCROC dairy. (Eric)

5. A solar photovoltaic system will be installed and tested on the WCROC swine finishing
barn. (Eric)

6. Horticulture growing facilities will be monitored for energy consumption. (TBD)

7. Funding will be solicited for developing energy-optimized horticulture systems. (Mike)

8. Funding will be solicited for energy-optimized cropping systems including transport
energy (tractors, trucks) and grain / feed processing (drying, grinding / mixing,
conveyance). (Mike and Rob)

9. Life cycle assessment will be initiated for energy-optimized energy systems within crop,
dairy, and swine enterprises. (Joel)

10. Nitrogen fertilizer production technologies developed in the Department of Chemical
Engineering and Material Science and the Department of Bioproducts and Biosystems
Engineering will be scaled up and tested at the Renewable Hydrogen and Ammonia
Pilot Plant. (Mike and Cory)

11. New funding will be solicited for post-doctorate research assistants to assist research
and publication of results. (Rob and Mike)

12. The renewable energy program will participate in planning for updated and new dairy,
swine, feed, and grain facilities to incorporate renewable and efficient energy systems.
(Mike and Eric)

13. A capital planning committee will be formed to develop ideas and pre-designs for
applied research systems. Potential funding mechanisms will also be identified. (Mike)

14. The renewable energy program will have at least four papers and / or abstracts
published in peer-reviewed journals and will give presentations at a minimum of 2
national conferences / meetings each year. (Rob, Joel, and Mike)

15. A renewable energy experiential learning program for University of Minnesota students
which complements Dr. Gardner’s on-line renewable energy course will be explored.
CFANS and UMM students will be encouraged to participate in the on-line class as well as the experiential learning program. (Rob, Joel, and Mike)

16. A second Midwest Farm Energy Conference will be hosted in the summer of 2017. (Mike)

17. The Renewable Energy Program web pages will be updated on a quarterly basis. (Joel)

18. An educational presentation will be developed and possible incentives to promote energy-saving behavior at the WCROC and on farms will be explored. (Kirsten)

19. The wind turbine and pilot plant will be well-maintained and clean. Safety and maintenance protocols will be followed and reviewed quarterly. (Cory)

20. The solar systems, small wind turbine, office, dairy, and swine energy systems will be well-maintained and clean. Safety and maintenance protocols will be followed and reviewed quarterly. (Eric)

21. Renewable energy systems, program vehicles, equipment, and offices will be well-maintained and clean. (Everyone)
WCROC Program Plan

Program Plan for: Swine

Overall Champions: Yuzhi Li/Lee Johnston

TWO YEAR FOCUS (2015-2017)

The swine program will continue to focus on swine nutrition and well-being. Societal concerns about modern pork production will drive a significant portion of our research. Our goal is to provide pork producers with practical, efficient production methods that accommodate consumer concerns and pig welfare needs whenever possible. Although specific research projects will be dictated by the availability of funding, they will be in the following areas:

1. Effective and efficient use of natural resources to produce safe pork: Feed cost are a continual concern for pork producers. We will investigate alternative feed ingredients such as ethanol by-products (DDGS) and others that can reduce feed cost and maintain pork quality. Consumers and food supply chain partners are demanding pork with reduced environmental impacts. We will work with other partners to research approaches to reducing the environmental footprint (eg. Carbon footprint) of producing pork.

2. Improve swine welfare while maintaining productivity and efficiency: Sow housing, castration, and compromised pigs are animal welfare issues that challenge the swine industry. We will strive to find solutions to these issues by conducting research into welfare topics such as tail docking, castration, and minimizing aggression in group-housed sows. Furthermore, individual housing of sows during farrowing and lactation seems to be a future target of consumers and welfare activists. We will transform our current group-housed farrowing system to an individual pen-housed farrowing system and begin research to understand that system in the U.S. swine industry.

3. Identify strategies to help alternative swine producers improve production efficiency. A challenge to alternative swine production is low productivity and poor efficiency. We will identify the key factors affecting production efficiency and tackle the issues through webinars and online publications.

4. Contribute to graduate and undergraduate education, with emphasis on experiential learning.


The success of the program will be measured by grants, publications, graduate/undergraduate student education, and extension/public engagement. Specifically, the achievable objectives will be:
1. Developing 5 grant applications for the federal, state and/or commodity agencies.
2. Disseminating research to broad audiences through publications in peer-reviewed journals (4 articles each year), magazines, newsletters, and websites.
3. Organizing one workshop and one field day for both alternative and beginning farmers each year.
4. Advising four graduate students, interns, summer students and/or visiting scholars each year.
5. Offering the first experiential learning course to undergraduate students.

KEY STRATEGIES and ACTION STEPS (2015-2017)

To obtain grants to support our research, we will target the funding agencies of USDA, National Pork Board, Minnesota Pork Board, Corn Growers, and other commodity groups. Strategies will include: targeting hot issues (such as high feed cost and animal welfare), utilization of research facilities at the WCROC, collaborating with faculty on St Paul campus, as well as researchers at other institutions (such as South Dakota State University and Iowa State University) and in other countries (such as Canada, Australia, and China).

The research projects will be dictated by funding availability. During the years of 2015 through 2017, research projects on tail biting, zinc nutrition, floor space allowance for group-housed gestating sows, floor space allowance for heavy-weight market pigs, nutritional value of plasma products and energy use/conservation in pork production systems will be conducted. These projects will include graduate and undergraduate students whenever possible. Our focus on renovation of the WCROC farrowing system will require significant inputs of intellectual effort, financial resources, and industry support. We will strive to make these conceptual ideas a reality.

We will continue to serve pork producers and the swine industry through extension /outreach efforts. In 2016 and 2017, we will organize workshops and field days for small-scale and beginning farmers, with emphasis on health monitoring, environmental management, nutrition, and breeding of pigs. We will demonstrate alternative swine production through field days. In addition, we will redesign our website that contains alternative swine production information. Our extension /outreach program for producers using all types of systems will ensure that Pork Quality Assurance and Transport Quality Assurance trainings will be provided on a regular basis. Our SowBridge and PorkBridge distance delivery programs will continue for national and international audiences in 2015 through 2017.

We will maintain at least 4 summer students, interns, graduate students, and/or visiting scholars supervised annually, depending on funding availability. In 2016 and 2017, we will collaborate with the appropriate faculty at UMM or other campuses to launch a new Experiential Learning course for undergraduate students.