

# 2018 Strategic Plan – A Guide for Our Future

West Central Research and Outreach Center

University of Minnesota

February 26, 2018



## 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 the third iteration of a plan to guide our work into the future. Our initial strategic plan was finalized in 2013, and re-assessed and updated in 2015. Previous versions of our plan were instrumental in charting a direction for our work. Our 2018 plan builds on past accomplishments and sets direction for the coming years. We've mapped out small and large steps we would like to take to advance our mission. Development of our strategic plan is the collective work by faculty and project leaders at WCROC in collaboration with the WCROC Advisory Committee. This plan represents our third version of looking into the future but it is not cast in stone; we realize the plan is malleable and may be adjusted periodically as needed to more fully realize our potential. As you read this document, please consider how you can help us, in large or small ways, to achieve our goals. 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  
February 2018

## 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 on page four. This mission statement set the boundaries for our planning activities and continues to guide our work.

Our first plan was completed in 2013 after multiple meetings with stakeholders, WCROC Advisory Committee members, faculty and project leaders. Ms. Sue Haglin (Insight

Training, Alexandria, MN) effectively guided us through this effort. From 2013 through 2015, faculty and project leaders worked to implement most aspects of the initial plan. In 2015, the strategic plan was updated by faculty and project leaders. The 2015 plan stayed true to the goals set in 2013 but provided new targets that advanced our original goals.

Having completed most of our goals set forth in the 2015 plan, we re-invigorated our plan in 2017. With the help of Ms. Haglin, the WCROC Advisory Committee, WCROC faculty, and WCROC project leaders worked to identify our strengths and weaknesses and how these attributes could help advance our mission given the current conditions in agriculture and society. This group also identified areas needing change as we move into the future.

Our goal was to establish a focused, short action plan for each discipline area (Crops, Dairy, Horticulture, Renewable Energy, and 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 in Communications. The following pages outline the tasks and goals we would like to complete in the coming years.

### **People involved in developing this plan**

<i>WCROC Staff</i>	<i>WCROC Advisory Committee</i>
Mr. Eric Buchanan, Renewable Energy Scientist	Mr. Grant Anderson, Swine and crops producer
Mr. Tony Feuchtenberger, Maintenance Supervisor	Mr. Paul Anderson, Crops producer
Dr. Rob Gardner, Renewable Energy Scientist (Program Leader)	Mr. Mark Ellison, Grain farmer
Dr. Brad Heins, Dairy Scientist (Program Leader)	Mr. Michael Flint, Farmer and Independent Agronomist
Dr. Lee Johnston, Swine Scientist (Program Leader and Center Director of Operations)	Dr. Frank Forcella, Ag researcher
Ms. Esther Jordan, Communications Specialist	Mr. Dave Johnsrud, Grain farmer
Dr. Yuzhi Li, Swine Scientist (Program Leader)	Mr. Paul Mahoney, Ag Loan Officer
Mr. Steve Poppe, Horticultural Scientist (Program Leader)	Mr. Mick Miller, Ethanol plant manager
Mr. Curt Reese, Research Plot Scientist (Program Leader)	Ms. Natasha Mortenson, Ag Educator
Mr. Michael Reese, Renewable Energy Program Director (Program Leader)	Mr. Lucas Sjostrom, Dairy farmer, Commodity organization CEO
Dr. Joel Tallaksen, Renewable Energy Scientist	Mr. Steve Stassen, Niche pork producer
	Mr. Tim Swedberg, Nursery owner/operator
	Mr. Jim Wulf, Cattle producer

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## MISSION

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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.

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## 5-YEAR STRATEGIES

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- Develop a 5-year staffing plan to advance the center's mission.
- Develop and implement the next generation of a robust marketing and communications plan that includes the following aspects: Website, social media, audience segmentation, marketing, and metrics.
- 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 for our facilities improvements.
- Develop and implement a plan to maximize learning experiences and outreach activities.
- Align program priorities to the UMN Grand Challenges that will help address the most critical challenges for Minnesota.

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## 2018 - 2020 PRIORITIES / BOLD STEPS

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- Develop a messaging and support plan to secure the addition of a faculty member in agronomy. (**Lee**, Lucas, Grant)
- Add more communications resources. (**Esther**, Lee, Natasha, Paul)
- Research the possibility a fund development officer position. (**Steve**, Lee, Paul, Natasha)
- Re-energize design and fund development for the Agricultural Research and Display Pavilion. (**Steve**, Mike, Esther, Tim, Mick)
- Design and install a back-up electric generator system. (**Tony**, Lee)
- Add a milking parlor and renovate the feed mill (**Brad**, Lee,)
- Target producers with learning experiences and information. (**Brad**, Jim, Curt, Grant)
- Develop an outreach plan to connect with non-ag students at UMM. (**Esther**, Lee, Tony, Natasha, Paul)
- Achieve our 2018 Program Plans. (**All** Program Leaders)

# WCROC STRATEGIC PLAN: CAPITAL ASSETS

UNIVERSITY OF MINNESOTA

*West Central Research and Outreach Center*

Overall Champion is: **Lee Johnston**

**DEVELOPING THE 21<sup>ST</sup> 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

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**In 2018 through 2020**, the focus will be on funding the completion of three projects: Farm Shop renovations, Agricultural Research and Display Pavilion, and the Midwest Organic Dairy Research and Education Complex. Additional capital asset upgrades including new construction, remodel, repair and maintenance, and asset acquisition will be made through internal and sponsored funding as appropriate.

### KEY MEASUREMENTS/OBJECTIVES - 2018 through 2020

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1. An Annual Capital Request will be submitted to the college and University administration.
2. \$ 1 million of external funding will be developed as a match for the Annual Capital Request.
3. The Annual Capital Request including the external funding match (item 2) will total over \$4 million.
4. The final phases of the Farm Shop Remodeling Project will be fully funded and completed.
5. Designs will be completed for the Midwest Organic Dairy Research and Education Complex (Organic Dairy Complex), and the Agricultural Research and Display Pavilion (Ag Pavilion).
6. Agricultural land purchases and major capital maintenance projects including funding options will be identified.

### KEY STRATEGIES and ACTION STEPS - 2018 through 2020

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1. Fund development activities will increase with the goal of generating financial contributions for capital projects and base operations.
2. The Organic Dairy Complex will be integrated in the overall University of Minnesota Livestock facility initiative emanating from CFANS in St. Paul.
3. Pre-design for the Organic Dairy Complex will be completed.
4. Pre-design for the Ag Pavilion project will be completed.
5. Next phases of the Farm Shop remodeling project will progress.

## **ADDENDUM TO CAPITAL ASSETS PLAN: MAJOR CAPITAL REQUESTS**

### ***Project 1: Agricultural Research and Display Pavilion (Estimated Cost: \$1,500,000)***

While the majority of WCROC's research addresses agricultural challenges in the Upper Midwest, our innovative and cutting-edge approach also serves as a global model. Each year, the Center hosts international scholars, producers and visitors eager to learn from the WCROC model. In 2017, the WCROC welcomed nearly 12,000 visitors.

The impact of the WCROC extends far beyond the academic community. The Center is not only an agricultural research hub, but also serves as an essential learning center for surrounding communities. Each summer, the WCROC employs dozens of undergraduate and graduate students in research positions in the areas of horticulture, dairy, renewable energy, and swine.

WCROC invests in providing engaging outreach programming that serves agricultural producers, farmers, students, and the general public. Each year, the Center hosts several community educational programs that serve thousands of community members including public school field trips, horticulture education classes, Organic Dairy Day, Horticulture Night, Field Days, group tours, and industry specific conferences.

The WCROC offers essential community resources and spaces that contribute to increasing vibrancy, vitality, and healthy communities, all important to the regional community's future. The demand for community gathering spaces at the WCROC currently outstrips what existing facilities can handle. Currently, the Center often turns away requests to accommodate community groups, and expanding programming is not feasible within available facilities.

To solve this challenge, WCROC seeks to build an Agriculture Research and Display Pavilion [name yet to be finalized] to enhance community learning and outreach for the regional community. This structure would include both indoor and outdoor seating accommodations for approximately 230 guests in a lecture format, along with indoor restrooms and a serving area. The construction of a Pavilion on the grounds of the WCROC will create new opportunities for outreach and education programming, both by the WCROC and the community at large.

As agriculture advocacy (agvocacy) continues to gain momentum both in the public sector and industry, it becomes increasingly important to have U of MN entities part of the conversation with consumers and stakeholders. A venue such as the Ag Pavilion will offer a place for producers to network, engage in agriculture education for students, and allow for consumer connections with the agricultural landscape.

A pavilion fund has already been established through the U of MN Foundation. Long-term Horticulture Display 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 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 Ag Research and Display Pavilion, Horticulture Display Garden, and the surrounding grounds:***

1. The pavilion will include indoor and outdoor seating accommodations for approximately 230 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. New greenhouse growing space and updating of existing greenhouse and storage facilities.
6. 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 is in the Garden as well as the other research and projects conducted at the WCROC.
7. 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.
8. 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.
9. Permanent shelter for registration at educational events.
10. 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.
11. IT
  - a. Supervised Control and Data Acquisition/Storage System
  - b. Install fiber lines
  - c. Telephone system upgrade
  - d. Data server
12. 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***  
***(Estimated cost: \$4,500,000)***

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. The feed milling system will include an emergency backup electrical generator.
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.

Program Plan for: **Communications**

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

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## TWO YEAR FOCUS

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From 2018 - 2020, communication efforts at the WCROC will further enhance the mission and vision of the WCROC by promoting the high quality work and extensive resources available at the WCROC. I will strive to consistently provide WCROC communication to internal and external audiences for each program, and develop marketing strategies that solidify our presence amongst stakeholders, producers, and general public.

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### KEY MEASUREMENTS/OBJECTIVES

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- Expand existing audience base to include a broader region of Minnesota.
- Identify communication opportunities within the region and state where we can share WCROC outcomes and successes, including program specific audiences as well as general audiences.
- Increase collaborations with the CFANS Communications/ Advancement team to solidify our presence within CFANS. Continue to provide ROC value to CFANS leadership through leadership, impactful stories, and relationships.
- Assist program leaders with promotion of program(s) and event communications to increase attendance and/or external awareness.
- Maintain a non-static web presence through the WCROC website.
- Develop strategies for engaging more with students; WCROC as a gateway into agriculture education and/or CFANS.
- Maintain consistent branding with all communications that reflects the mission and vision of the WCROC, CFANS, and the U of MN.

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### KEY STRATEGIES and ACTION STEPS

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- Conduct analysis on audience segmentation: who we currently communicate with, and identify demographic groups and trade organizations that we should be engaging with (either new contacts and/or rate of frequency).
- Leverage communication resources with other members of CFANS Advancement and Development Teams.
- Create communication strategies for events and/or programs. Offer communication tools to program leaders for maximizing audience reach, and consistent messaging.
- Offer communication support to the WCROC and all program areas for events, newsletters, mailings, press releases, etc.
- Use analytics to assess WCROC website pages. Make formatting and site content changes as necessary based on program needs, audience views, and page clicks.

- Establish a schedule for visiting with program leaders to update website content. Review and update content on WCROC website annually.
- Promote WCROC research, outreach and activities through popular press, social media and other networks.
- 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**

UNIVERSITY OF MINNESOTA

*West Central Research and Outreach Center*

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## TWO YEAR FOCUS

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- Maintain the highest economical crop production.
- Work on projects with the Morris Regional Extension Crops educator.
- Continue joint field days with Extension that require coordinated planning. Potentially develop a forage and/or cover crop field day.
- Continue and start new research on organic and cover crop topics.
- Increase research topics addressed at WCROC.
- Increase crop and forage yields by utilizing high tech methods such as grid sampling, and other techniques such as cover crops.
- Participate in research with WCROC swine scientists and ARS staff for the refinement of camelina production.
- Update and add to the Agronomy and Soil Science web page.
- Redo weather section of the website.

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## KEY MEASUREMENTS/OBJECTIVES

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- We will continue to look at yields and will start making trend lines for production over the past five years. We will continue to look at forage production and quality.
- We would like to have two field projects with the Morris Regional Extension Crops educator. Along with the projects, we would like to develop and plan a Field Day. The Field Day will be considered successful if we have at least 150 people in attendance.
- We want three more research studies and a wider range of topics in 2019. Ideally, we maintain the core traditional research but expand to cover crops and alternate crops.
- We can look at variable rates for fertilizer and see if yields can be increased or expenses decreased. Our corn trial has been very useful in selection of hybrids. We will continue to do this trial and maybe include soybean yield tests.
- The weather webpage is one of our Center's most popular pages. I would like to build on this popularity and add more information from the DNR station and begin to make this information more readily accessible to interested people.

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## KEY STRATEGIES and ACTION STEPS

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- Key strategies will be to understand yield limiting factors in the cropping systems and take actions to increase yield and reduce expense.

- We will attempt to have better communication with researchers and Extension staff. This may increase the likelihood of doing projects with them.
- We will need to increase our knowledge base on other crops that we are familiar with. This will be key in successful use of cover crops and growing camelina.

### **Outcomes**

- Refinement in our farming practices will lead to increased production with less input. This will occur over a long time and will vary from year to year based on the weather. However in five years we should be able to start seeing a trend.
- By doing research on crops like camelina, we may be able to contribute to diversifying crop production in our local area and western Minnesota. We are fielding more production questions from producers and expect inquiries to increase.
- Activities such as conducting an organic corn performance trial, offering specific field days and working with Extension on projects will increase public awareness to our stakeholders.

Program Plan for: **DAIRY**

*West Central Research and Outreach Center*

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

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## TWO YEAR FOCUS

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The focus for the dairy program is solidified for the next 2 to 4 years because of large multi-year USDA-OREI (Organic Agriculture Research and Extension Initiative) grants that focus on forages, animal health, and genomic and crossbreeding. We are collaborating across multiple universities with these projects. We will continue to focus on precision technologies for organic and grazing dairy cattle to improve fertility, health, and well-being of cattle. Extension efforts will include many field days, workshops, and online presentations and articles.

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## KEY MEASUREMENTS/OBJECTIVES

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- We will publish 4 articles from the research completed at WCROC each year.
- Continue to seek out strong potential graduate students to work with projects at the WCROC dairy.
- We will continue the WCROC Organic dairy day program. Organize at least 1 organic dairy field day on a Minnesota farm during summertime.
- I will continue to apply for grants for organic and conventional dairy funding, calf and heifer research, as well as precision technology and welfare of grazing animals.
- Continue to incorporate renewable energy technologies into the WCROC dairy program through research and extension.
- Continue to efficiently manage the dairy unit to improve animal welfare and well-being, as well as improve the financial performance of the dairy.
- Align program priorities to the UMN Grand Challenges that will help address the most critical challenges for Minnesota.
- Develop international collaborations to expand research capabilities at WCROC.

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## KEY STRATEGIES and ACTION STEPS

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- Develop a more structured communication efforts of the dairy program through various media and an increased online presence. Also, include ways to monitor metrics for the outreach and communication efforts.
- Develop a video on the programs at the WCROC dairy.
- Continue to work with CFANS administration in St. Paul and dairy industry leaders to fund the dairy facility at WCROC.

- Effectively manage OREI projects and continue collaborations between WCROC and St. Paul campus faculty, as well as collaborators on both OREI projects.
- Work with 4-H Dairy program in Stevens county and state to increase the number of youth in involved in the dairy project.
- Establish a UMN Dairy Advisory Committee.

# WCROC Program Plan

Program Plan for: **Horticulture**

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

## TWO YEAR FOCUS

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The horticulture program will continue to run successful annual and perennial flower trials, plastic culture systems, prairie pollinator restoration and small fruit research, as well as maintain the beauty of the Horticulture Display Garden. Educational events, such as Come Grow with Us and Horticulture Night, will draw in home owners and garden enthusiasts from the greater region. In 2018-2020, more emphasis will be placed on meeting the gardening needs of millennials and younger families.

## KEY MEASUREMENTS/OBJECTIVES

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- Add educational display(s) and interpretation to the Horticulture Display Garden that emphasizes growing fresh food with a minimal amount of space.
- Increase engagement with area youth and young families.
- Continue fund development strategies for the proposed education center [Ag Pavilion].
- Continue marketing the Garden beyond the immediate area as a resource and destination.
- Replace the aging tree line windbreak around the Horticulture Display Garden.
- Successfully apply for and receive grant funding for horticulture research.

## KEY STRATEGIES and ACTION STEPS

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- Utilize small space vegetable gardening techniques to create educational display(s) geared towards those with minimal gardening space and/or limited time to grow their own fresh food.
- Expand children's educational programming by leveraging partnerships and resources with University of Minnesota Morris, area Master Gardeners, and MN Extension staff.
- Explore utilizing social media as means for offering education.
- Redefine objectives for the education center [Ag Pavilion] to include all WCROC program areas.
- Develop plan for replacing windbreak surrounding the Horticulture Display Garden, without compromising existing garden beds and the required sun/shade. Consider how the renovation could be used for educational demonstration.
- Collaborate with other U of MN departments, centers and USDA in pursuing potential research projects.

Program Plan for: **Renewable Energy**

*West Central Research and Outreach Center*

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

The primary goal of this plan is to conduct research and outreach supporting the reduction of fossil energy consumption in production agriculture.

## TWO YEAR FOCUS

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**In 2018 through 2020**, the Renewable Energy Program will focus on improving key energy loads within production agriculture that have been identified through energy audits and life cycle assessment. Renewable and efficient energy systems will be tested in production settings as potential replacements for antiquated systems located on farms. Research within the Gardner Group will also focus on using environmental microbiological methods for capture, conversion, and recycling nutrients within agricultural waste streams. These nutrients will be used to develop value added products and increase agricultural sustainability.

## KEY MEASUREMENTS/OBJECTIVES

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- Novel anhydrous ammonia production technologies will be tested and an innovative energy storage system will be further developed at the Renewable Hydrogen and Ammonia Pilot Plant. This may include long term storage of wind energy and transportation fuel displacement using anhydrous ammonia.
- Energy audits will be completed at commercial dairy operations in Minnesota and within the horticulture program at the WCROC.
- Energy-optimized systems including electric vehicles will be further tested and refined in the WCROC dairy and swine programs.
- Life cycle assessment of crop, dairy, and swine will continue and a new effort will begin in horticulture.
- Solutions will be explored for reducing fossil energy consumed in drying grain.
- The Gardner Research Group lab will conduct research using microbial methods to capture, convert, and recycle nitrogen and phosphorus within agricultural waste streams.
- A post-doc will be hired and 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.
- The renewable energy program will develop more effective and impactful outreach to farmers, agricultural and energy professionals, and University of Minnesota students.

## KEY STRATEGIES and ACTION STEPS

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- Results from the energy consumption audits and life cycle assessments of WCROC swine, dairy, and crop production systems will be published.
- Results from the solar sow cooling and piglet warming projects will be published.
- Grant proposals will be developed for:
  - A project to audit energy consumed in grain drying and to test energy-optimized systems.
  - A project to expand research into using anhydrous ammonia as a short, mid, and long-term storage medium for wind and solar energy.
  - A project to use anhydrous ammonia as a fuel in agricultural applications.
  - To audit energy consumption at commercial horticulture operations.
  - To continue funding on microbial capture, conversion, and recycle of nitrogen and phosphorus.
- Nitrogen fertilizer production technologies developed in the Department of Chemical Engineering and Material Science will be scaled up and tested at the Renewable Hydrogen and Ammonia Pilot Plant.
- Life cycle assessment will be continued for energy-optimized energy systems within crop, dairy, and swine enterprises.
- An electric vehicle fast charging system will be installed at the WCROC using energy produced from a new solar PV system. The solar system will also provide shade to dairy cows.
- A third Midwest Farm Energy Conference will be hosted in the summer of 2019.
- WCROC horticulture growing facilities will be monitored for energy consumption.

Program Plan for: **Swine**

Overall Champions: **Yuzhi Li/Lee Johnston**

Lee Johnston will oversee implementation of this plan. Yuzhi Li will lead the plan to completion by Dec 31<sup>st</sup>, 2019.

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## TWO YEAR FOCUS

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- During the next two years, the swine program will focus on low-carbon footprint swine production, swine nutrition, swine well-being, and understanding organic swine production.
- We will investigate the most efficient methods to satisfy the thermal needs of various classes of pigs using renewable energy and new technologies.
- We will work with farmers and stakeholders to identify key issues faced by organic swine producers and explore possibilities of establishing a research and extension program at the WCROC focused on certified organic pork production.
- We will continue to work with commodity groups to improve swine health, production efficiency, and pork quality by utilizing novel feed ingredients. We will continue to improve swine well-being by reducing harmful behaviors of pigs.
- We will design a pen housing system for farrowing/lactating sows, and transform our current confinement farrowing system to a pen-farrowing system and begin research to understand that system in the U.S. swine industry.
- We will provide learning opportunities for local farmers, graduate and undergraduate students, and high school students, with emphasis on experiential learning.

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## KEY MEASUREMENTS/OBJECTIVES

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The success of the program will be measured by grants, publications, graduate/undergraduate student education, extension/public engagement and collaborations with St. Paul-based faculty. Specifically, the achievable objectives will be:

- Developing 5 grant applications for the federal, state and/or commodity agencies.
- Disseminating research to broad audiences through publications in peer-reviewed journals (4 articles each year), magazines, newsletters, and websites.
- Organizing one workshop and one field day for organic, alternative, and beginning farmers each year.
- Advising four graduate students, interns, summer students and/or visiting scholars each year.
- Collaborating with St. Paul-based faculty (scientists of USDA-ARS, or other industry professionals) on at least 3 research/outreach projects per year.

- Redesigning an experiential learning course for undergraduate students to focus on ag production systems.

## **KEY STRATEGIES and ACTION STEPS**

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- To obtain grants to support our research, we will target funding agencies such as USDA, National Pork Board, Minnesota Pork Board, Corn Growers, LCCMR, and other commodity groups. Strategies will include: targeting industry and socially-relevant issues (such as reducing environmental impact of animal production, energy efficiency, animal welfare, organic swine production, and utilizing by-products of cover crops in swine production, and use of alternative feed ingredients and strategies in swine nutrition), efficient utilization of research facilities at the WCROC, and collaborating with faculty on St Paul campus and beyond.
- The number and type of research projects will be dictated by availability of funding. During 2018 through 2019, research projects on organic swine production, utilizing cover crops as feed ingredients to reduce feed cost in organic swine production, understanding tail biting, refining zinc nutrition, energy use/conservation in pork production systems, and reducing carbon footprint in swine production 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 pig farmers and the swine industry through extension/outreach efforts. In 2018 through 2019, we will organize webinars, workshops, and field days for organic, alternative, and beginning pig farmers, with emphasis on health monitoring and environmental management in organic pig production, alternative feed ingredients, alternatives to antibiotics, and producing cover crops for organic pigs. Research updates will be posted on the WCROC and Extension websites. We will continue to provide Pork Quality Assurance and Transport Quality Assurance trainings to swine producers involved in conventional and alternative pork production systems.
- Collaborations with St. Paul-based faculty, faculty from other universities, scientists from USDA-ARS, and industry professionals will expand the reach of the WCROC Swine program. Projects (research and outreach) will be conducted collaboratively with other professionals in WCROC facilities, in USDA-ARS facilities, and in private industry facilities.
- We will maintain at least 4 summer students, interns, graduate students, and/or visiting scholars supervised annually, depending on funding availability. We will collaborate with the appropriate faculty on St. Paul campus or other ROCs to launch a new Experiential Learning course for undergraduate students.