

Agricultural Research Stations
Annual Report
For Calendar Year 2017

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Executive Summary

The Agricultural Research Stations had a very successful year in 2017. The research stations continue to meet their main mission by ensuring campus Principal Investigators have access to land and bench space; thus accommodating their vast and various research, teaching, and outreach needs. Across all units over 1100 research projects were completed while servicing close to 300 Principal Investigators. Additionally, almost 32,000 people formally visited the stations to partake in a field day or tour. Uncounted multitudes more visited the stations to walk gardens, see research plots, or take in the greatness of the animals and plants living on taxpayer owned lands. The Agricultural Research Stations continue to be the embodiment of the “Wisconsin Idea”.

Included behind this Executive Summary are individual reports from each Station and the Campus Greenhouses. Each station manager was asked to report on activity in the following areas:

- Notable Station Achievements
- Outreach/Instruction Activities
- Research Activity
- Change
- Goals for the Coming Year
- Areas of Concern and Challenges

Several common themes emerge from these station reports. They include:

- Stations continue to be successful with visitor and community involvement. Novel mechanisms are being employed by several stations to ensure field days/tours are relevant. One station sought a novel tour model to show the work of the station and then engage stakeholders in discussions regarding water quality and what the station is doing to be relevant in this key research area.
- Stations are continually evolving to meet needs of a diverse pool of research needs. Staffing and land management are continually reevaluated; thus adapting to different research projects. Work for researchers needing new crops established can be difficult and time consuming, but stations try to accommodate as much as possible.
- Although not completely without error, stations meet research project demands with a high level of precision. This ensures strong repeatable data is available to principal investigators. When errors are made, process improvement is sought.
- Many stations rely on sales of grown commodities to meet budget demands. Slumping prices of several commodities are making meeting the budgetary demands of the station very difficult.
- Declining number of faculty utilizing research stations has station managers worried about long term viability of each of their stations.
- Aging infrastructure at all stations is an ongoing balancing act. Paucity of maintenance dollars makes meeting all station maintenance needs very difficult.

- Many stations, but particularly those stations located close to the Madison job market, feel continual pressure to have their staff hired away. Proposed pay plans and discretionary compensation funds have helped alleviate some of this pressure.
- In short the research stations are in a strong position and prepared to meet the demands of CALS faculty in 2018 and beyond.

**Research Projects and PI's using Ag Research Stations
 Cropping Year 2017
 Compiled by Jane Cahoon**

Station	Field Crop Research	Fruit Crop Research	Animal Research	Natural Resources/ Turfgrass	Campus PI's	Total PI's
ARLINGTON	300		26		45	40
HANCOCK	141				36	39
USDFRC	4		9		1	5
KEMP				53**	20	22
LANCASTER	35		7		16	16
MARSHFIELD	50		22		16	18
OJ NOER				56	4	4
PENINSULAR	1	22			7	9
RHINELANDER	2				2	2
SPOONER	26	2			11	15
WEST MADISON	61	4	5	6	41	41
GREENHOUSES*	250 - 450				70	70
TOTALS	890-1090	28	56	111	269	284

* It is estimated that 250-450 projects occur in the Greenhouses each year.

**Projects: DNR = 9, UW Non-CALS = 7, UW CALS = 19, Federal = 4, Other UW System = 5, Other = 9

2017 TOURS/SEMINARS ON AG RESEARCH STATIONS
 Compiled by Jane Cahoon
 2/20/18

Station	<u>Field Days</u>	<u>Tours</u>	<u>Instruction</u>	<u>Seminars/ Meetings</u>	<u># of People attending</u>
ARLINGTON	3	128	7	53	8796
HANCOCK	6	15		40	2440
USDFRC		12			300
KEMP		14	14	39	4207
LANCASTER	3	11	5	5	475
MARSHFIELD	1	35		122	6250
OJ NOER	3	15		3	1007
PENINSULAR	1	5	2	4	1967
RHINELANDER	1	5	1	5	500
SPOONER	1	1	1	5	479
WEST MADISON	4	14	20	46	5048
GREENHOUSES		2	2	4	375
TOTALS	23	257	52	326	31844

Arlington Agricultural Research Station 2017 Annual Report

1. Notable station achievements:

The new Blaine Dairy 9.5 million-gallon manure lagoon finished its first full year of operation. Limited amounts of liquid manure were hauled out this spring allowing us to focus on hauling solid manure and field work. In fall we worked with a custom applicator to dragline nearly 7 million gallons of manure off station onto neighboring farms with manure agreements. Some of these fields were over 3 miles from the dairy. Using the dragline system saved a tremendous amount of wear and tear on equipment and roads and was accomplished in only a handful of days. This system allows us to get more manure off station and is a great step toward our goal of reducing the high soil test phosphorus levels on the station.

The stumps and brush were removed from fields 583, 598, and 599. They were raked to remove branches and roots, tilled and winter rye was planted as a cover crop. The fields were boundary mapped and soil sampled and are ready to be put back into production for 2018. The fields will be planted to corn with no-tillage for several years as roots continue to decompose. This will add roughly 32 acres of production land at the station to aid in our continued need for more forage and grain crops.

Crop yields were lower than in 2017, but respectable considering the challenging wet spring, cool summer, and dry fall that we dealt with. We were able to raise enough forage and grain for the station animal units and feed mill anticipated needs, but supplies will be tight.

The station hosted both the Columbia County Moo-Day brunch in June and the North American Manure Expo in August. Thousands attended the events deemed a great success and provided great exposure for the station.

We hired nine new employees in 2017. We were given more flexibility with wages which allowed us to attract good candidates. Among these was a new assistant superintendent who brought a wealth of nutrient management knowledge and experience.

2. Number of research projects:

300+ Crop-related research projects with over 40 PIs supported

26+ animal research projects with 10 PIs supported

The feed mill also provided feed for trials on campus and Vet Medicine.

3. Change:

Several key researchers and long-time station users are retiring or are near retirement. Positions take a long time to refill (if they are refilled at all). This leaves uncertainty about station land usage and services that will be needed. It also places more responsibility on the station to help to “bridge” this open time.

The majority of our budget (~88%) is generated by services and feed we provide to researchers or crop sales. Much is provided at or near cost. That makes us vulnerable to market swings as well as management decisions by the researchers or unit managers, who are also under intense pressure with tight budgets. We have the equipment and staff to provide the lowest cost feed and services when we can utilize it across all enterprises. Cuts or decreases in use in one area will lead to cost increases for others.

4. Station goals for the coming year

The station goal of increased implementation of precision technologies continues to move forward. We purchased additional GPS equipment last fall and are exploring options to add more of our equipment to our RTK network. The improved accuracies will allow for more precise cultivations, increased planting accuracy and allow for more in-season nitrogen applications. We also purchased a system from CapstanAG, allowing individual sprayer nozzle control to reduce overspray and maintain target rate of application. This is a big improvement especially while working around or in various research plots.

High speed internet is non-existent around the station. Currently all the headquarters staff share two 3.0 Mbps connections. Slow internet hampers productivity and leads to frustration. Several options are being investigated which could involve expanding fiber optic cables from Arlington or line-of-sight to a State Patrol tower in DeForest to station headquarters. The signal would then go to the individual units. Funding will be needed.

Several major land projects still need to be completed including: Brush and stump removal from the former forestry studies south of the sheep facility; removal of subsoil material by the gravel quarry; reconstruction of waterways by the Dairy and Horticulture. We will also continue to clean up areas of the station that have become unsightly in recent years.

This will hopefully be the year that the WPDES permit is renewed by the DNR. We are still operating under the permit that expired in July 2013. We have done everything that we needed to do for renewal and are waiting on action from the DNR.

We will work with the US Dairy Forage Research Center to harvest their alfalfa crops. This partnership will allow us to cover more acres to better utilize existing equipment and staff in order to keep fixed costs to a minimal level.

5. Areas of concern and challenges

Retaining good employees has been a challenge because of low wages and no recent wage increases. Recently announced increases (4%) and DCFs help, but will only make a dent into the years of stagnant wages and increasing benefit costs. There are many employment opportunities in the Madison area that we cannot compete against.

The station does not have a large enough land base to support the research projects, raise crops for feed, and apply animal manure. The quantity of animal manure produced exceeds the current land capacity for sustainable application while supporting research. Soil test phosphorus levels on many fields are increasing into a range where applications will be limited. We have manure application agreements with several neighboring farmers. We also

cash rent or have crop purchase agreements on approximately 400 acres. This is costing over \$130,000 per year. Competition for land is intense because of several large dairy and grain operations in the immediate area. We unsuccessfully bid on a 180 acre farm adjacent to the station that would have helped alleviate the land concern. The successful grain farm got the contract with a \$450/acre bid. With the current state of the farm economy we need to be ready for opportunities, should they present themselves, to purchase or lease additional land.

Existing forage bunkers can only hold three of the four alfalfa cuttings and there is not enough space to place the needed number of feed bags. The bunkers were constructed in a wet area and tile drainage for leachate was incorrectly installed. It was also noted by the DNR that bag sites must be rotated and rested so a site can only be used every third year. More bunkers or a concrete feed pad with runoff collection is needed. Storage buildings for straw, hay, and equipment are also needed.

It is a challenge to keep safety programs and training up to date, especially with personnel from academic departments. Safety is not a top priority for the departments and often falls back onto ARS for compliance.

The feed mill was built in the late 1960s. While still functioning, it is showing its age. The pneumatic feed transfer system has caused two customers to purchase commercial feed due to excess fines in the diet. A solution will have to be found about how feasible it will be to replace the current structure.

CALS Research Greenhouses ARS Annual Report 2016/2017 November 13, 1017

Encompasses:

- Walnut Street Greenhouse ~15K sq. ft. bench space
- King Hall (Soil Science) greenhouse ~ 2K sq. ft. bench space
- 2 greenhouses at West Madison station ~4600 sq. ft. bench space
- Eagle Heights research field ~3 acres

Staffed by:

- 2 full-time managers
- 1 full-time horticultural technician

Serves:

- **Campus-wide facility**
- **~70 UW faculty, ~55 active at a given time**
- **~230 users and ~140 projects at any given time**
(Federal and campus researchers, emeritus faculty, visiting scientists, technicians, post docs, graduate and undergraduate students.)
- ≥ 12 departments
- ≥ 5 additional organizations/groups
(Lakeshore nature preserve, GLBRC, WI Energy

Institute, etc.)

1. Notable Station Achievements:

The Walnut Street Greenhouses have relentlessly improved the facilities in both large and small ways.

Major Improvements:

- Resurfaced flooring at King Hall (greenhouses 3 & 4), prevents water leakage into labs below.

Smaller Projects:

- Installed fertilizer injection system at King Hall Greenhouse.
- Upgraded AC unit in King Hall Greenhouse #2.
- Repainted King Hall Greenhouse.
- Conducted spectrophotometer readings of different greenhouse roofing materials to determine which greenhouse material is best for an eventual renovation.
- Obtained and installed defibrillator.
- Obtained new computers for the office.
- Created a training video for greenhouse users, regarding proper watering, fertilization, and other growing tips.
- Conducted diverse plant trials to determine best growing methods: corn trials, low phosphorous, FeSO₄, sulfur, sprint 138, sprint 330, tissue analysis.



- Conducted pesticide phytotoxicity tests on 8 chemicals: Grandevo PTO, PyGanic, Triathlon BA, Applause, Savate, Altus, Agrimycin 17, Venerate.
- Obtain, maintain and utilize a donation of 15 1000 watt lights from Harris Moran seeds (valued at 4950\$)
- Utilized 300 hours of volunteer labor.
- Conducted three rounds of inbred corn trials to determine the best fertilizer frequency.
- Introduced 4 new pesticides after extensive phytotoxicity and efficacy testing.
- Purchased LED lights, currently conducting growth efficacy tests.
- Reworked sinking concrete at entrance to both West Madison greenhouses.
- Replaced soil trap with stainless steel unit

2. Outreach/Instruction Activities:

Hort 120 students (2) – 20 hours of service & instruction on greenhouse management.
 Tours for Eileen Nelson's short-course
 Presented at annual Plant Care Workshop, 40 attendees

3. Research Activity:

Currently, there are ~125 projects at Walnut Street, with another 10 at the West Madison greenhouses, and 8 at King Hall. In the spring, we anticipate at least another 14 projects at the Eagle Heights research field. However, it must be noted that while we have as many as 150 projects utilizing our space at one time, projects may last a matter of a few weeks, months, or years. We estimate that somewhere between 250 and 450 projects utilize space at our station each year.

4. Change Over Time:

The research greenhouses no longer have the capacity to satisfy the demands of the users. Often, researchers have to wait to be able to obtain greenhouse space and sometimes the quality of space is not the quality that researchers desire.

5. Goals for Coming Year:

- Conduct LED experiment with Max Light.
- Redo the side walls at West Madison Greenhouses.
- Conduct silicon experiments (soil and foliar) in collaboration with Dr. Weng.
- Investigate the construction of a permanent RO line for easier access to purified water for cranberry researchers. If this option is viable, construct this line.

6. Areas of Concern and Challenges:

As mentioned above in the change section, we struggle to provide enough space and the quality of space that researchers need. We are also challenged by having to maintain a large number of air-conditioners, fans, motors, maintenance machines and vehicles with a very small budget. It would be ideal to be able to hire a trained electrician/mechanic to handle electrical and mechanical repairs in-house. Our current staff maintains and repairs what they are able to, but some items need more technical expertise, and Physical Plant tradesmen are often very expensive when called. This position would not need to be a full-time position.

Hancock Agricultural Research Station Information for 2017 ARS Annual Report

By Felix Navarro and Troy Fishler

2017 Notable Station Achievements

- 1. Staffing:** 2017 was a positive year for the Hancock ARS in many fronts and like in any year there are things that we were able to learn from and hopefully improve upon in the future. Notable achievements were:
 - **Labor quantity and quality** was very good (we had a stable staff that in the summer reached 17 employees, including 7 students).
 - **We were able to hire two additional staff** (Justin Wilcox and Tiffany Bucccholtz) without affecting our 101 dollars. This is added to Amber Gotch, who is paid from 136 Storage Research Facility revenues and Samuel Perez paid by a combination of 136 and 133 funds).
 - April 21, 2017 **Sam Perez was awarded 2017 University Staff Award**. This is a university-wide award. Thanks to James Busse and Paul Bethke for supporting this submission.
 - **HARS 101 Budget for FY17 (\$448,922) was executed and we finished FY17 in a balanced situation**. We had a negative balance for salaries (\$30,764) partially offset by savings on supplies and expenses due to donations particularly of pesticides (\$24,000) and others. We appreciate Dr. Amanda Gevens and Dr. Russ Groves collaboration on getting these donations. For FY18 we expect to finish our 101 budgets without a negative balance.
 - **Maintenance support obtained for the Potato and Vegetable Storage Facility (SRF)**. After many discussions and negotiations with the Wisconsin Potato and Vegetable Growers Association, the SRF committee decided to recommend a permanent line of **\$25,000** in the WPVGA budget. This will help resolve a structural deficit in the SRF 136 budget.
 - **SRF fee-for-service revenue continued to grow (FY15: \$66,900 FY16: \$74,500 FY17: \$109,500)** primarily driven by the rollout of the new 1,000-pound box bin program as a viable mid-volume storage option in FY16 as well as growing our independent third party ag insurance claim verification services offered to our Wisconsin ag insurance industry partners.
 - **SRF \$17,000 USDA collaborative research grant (Bethke/Fishler)** to help fund Tiffany Buchholz's 6-month SRF assignment.
- 2. Improvement of Capacity:**
 - **New Variable Rates of Irrigation (VRI) control in the K lateral move system:** In 2017 we tried with remarkable success a Reinke VRI Lateral Move modification to the Hancock ARS K linear irrigation system. This system can deliver irrigation rates in sectors and zones consistent with desired experimental designs. Prior to this enhancement several researchers divided fields in strips where irrigation rates were regulated with different nozzle packages with limited choices for experimental design. The area covered so far includes 12 fields approximately typically 600' x 156' (25.5 acres altogether). The cost of this enhancement was **\$23, 600**. Research demand in 2018 is to expand to the 20 additional K fields (42 acres). Faculty doing VRI research in 2018 include Shawn Kaeppler and Natalia de Leon (Agronomy), Yi Wang (Horticulture) and Matt Akins (Dairy Science).

- **Enhancement of the Potato Grading Shed**

We finished connecting the walls, insulating and adding heating to the grading shed, a project cost shared by station 136 funding, Hatch Capital, Minor Remodeling, WPVGA Associate Division and faculty dollars (Colquhoun, Endelman, Gevens, Groves). This enhancement will increase stretch the time available for grading usually limited until late October due to low temperatures. Being able to grade over the length of the storage season will bring additional research possibilities. A second objective is to have a building free of CIPC, a sprout inhibitor applied as thermal fog (gas) in the Storage Research potato to keep potatoes from sprouting. Stretching the grading season allowed grading fee for service revenue for some \$15,000.

- **SRF Acquired a 40' x 60' tarp house** decommissioned from the Spooner Ag Research Station. HARS & SPARS teams disassembled and HARS team excavated and reassembled structure for less than \$4,800 in materials to date. This represents a savings of \$30,000 if we had the tarp house manufacturer excavate and build the same structure for us.

3. **Outreach/instruction activities:** Field days (6) and Tours (15) attended by 2440 people. Most attended field days were: Waushara County Dairy Breakfast (1000+), Potato Research Field Day (200+). Rural Youth Safety Day, Pea Festival and Garden Field Day, each 100+. The conference room hosted 40 meetings/events (~600 people). We kept station website and facebook websites. Facebook post reach (number of people who had any posts from our page enter their screen) was the highest in August 5, the day of the HARS Garden field day: 673. Online responses were also high for Pea Festival, Potato Field Day and Potato Variety Expo.

4. **Research Activity:** In 2017 HARS supported 200 projects for 42 research groups in 118.5 acres and the Potato and Vegetable Storage Research Facility. Of the 42 research groups, 26 were from the UW-Madison campus. UW-Madison campus researchers used 86% or more of the resources (field area) and represented \$42,690 or 59% of the field chargeback invoiced. Crops researched in Appendix A. The Storage Research Facility was used by 8 UW-Madison faculty and 4 industry partners for a total of 37 potato storage research projects (30 in lockers and seven in bulk bins or macro-bins). An idea of the output and impact of the research is shown 17 refereed journal articles (Appendix B) of work done at HARS. This was a quick Google Scholar search showing a portion of faculty research done at HARS.

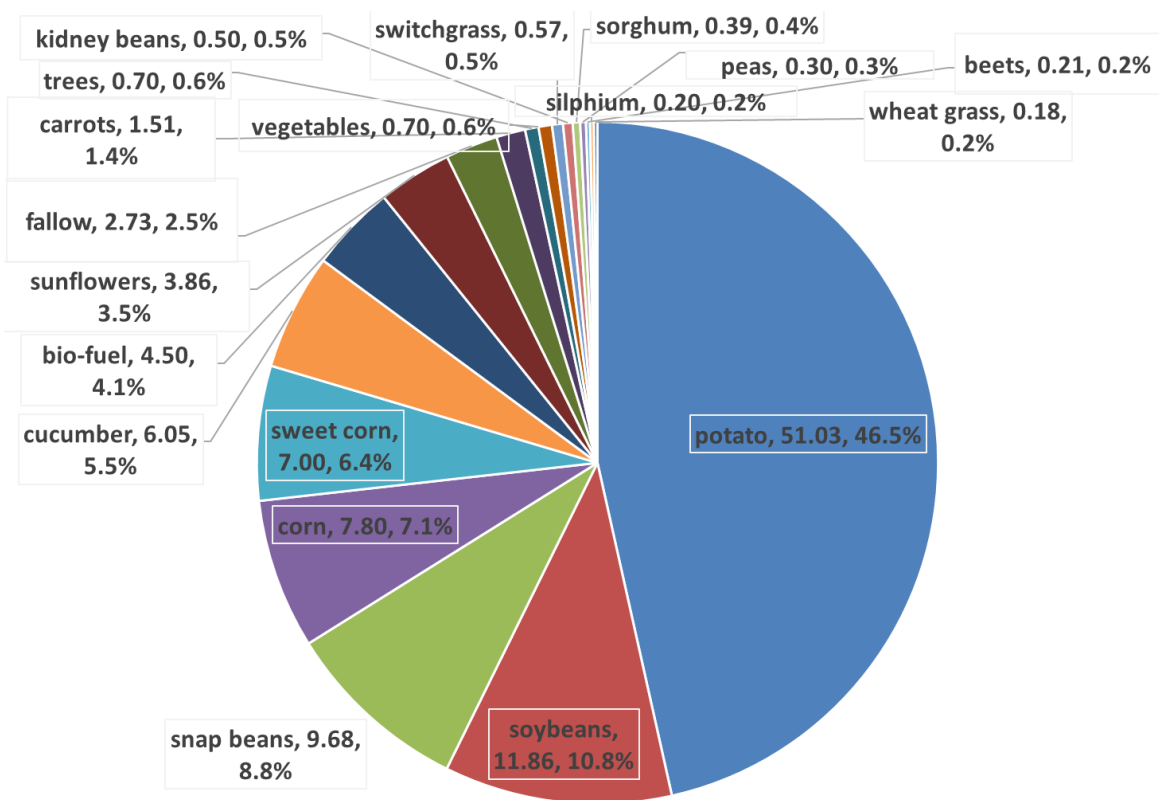
5. **Change:** There is a continuous need both for field and storage research that represents both opportunities and challenges. Some of the changes we have done such as the 1,000 lbs macro-bin level research at the SRF, the Grading Shed Enhancement and the VRI System for precise irrigation water research has been responding to those needs.

6. **Station goals for the coming year (Main Goals)**

- a) ***Maintain a 100% record of successes on field and storage research projects*** as measured by not being significantly affected in a negative by station management and practices.
- b) ***Add five fields (spans) with VRI*** capacity in the K fields
- c) ***Finish the tarp house*** south of the SRF and concrete pad west of the SRF and wash area with electric control box to power pressure washer.
- d) ***Make modifications to AgRay equipment for optimizing singulation.***

- e) **Maintain Station Farm and SRF budgets with a positive balance** while attending expense needs.
 - f) **Finish replacing the original thin sheet metal walls in the three remaining bulk bins** that haven't been updated yet with the more industrial heavier gauge sheet metal installed in the remodeled bins.
 - g) **Develop a post-fry finished chip moisture protocol** using our recently-acquired finished moisture analyzer from AJ Bussan's former lab and use it to determine the finished moisture of our chip fry protocol.
 - h) **New roofs for the Vegetable Handling Shed and Field Office.**
 - i) **Work with the Ortery software design team to develop the capability of our in-house high resolution Ortery photo light box to improve throughput of L, a, b chip color values.**
 - j) **Identify software or a database platform for managing real-time seed, planting, field, harvest, storage and manufacturing variety development data.** This software would be especially suited to projects that undergo field and storage trials at HARS. Faculty, allied industry collaborators and growers interested in learning how the varieties performed in the Wisconsin trials would have the ability to print "on demand" customized reports by logging in via remote web access.
7. **Areas of Concerns and Challenges:** There are three specific areas of concern that we will like to improve upon in 2018 and years to come:
- a) **Safeguard the Integrity of Research Projects:** The HARS has a great track record on safeguarding research projects for 100% success. We want to work with faculty and staff to establish clear guidelines and standard practices using all necessary means to reassure such success.
 - b) **Improve Irrigation by more Closely Targeting Crop Irrigation Needs:** Research in multiple crops at the Hancock Agricultural Research Station sometimes presents the challenge of deciding what crop to irrigate for when crops share the same field. In other cases, rates of irrigation should be chosen based on disease risks or other concerns affecting performance. We recognize that this is one aspect that has room for improvement. Plans to use VRI in the whole K linear system will help best manage water as well as irrigation based in crop needs and risks. Special concerns of overirrigation exist for crops such as soybean due to white mold susceptibility and yield effects.
 - c) **Improve Chemical Safety:** HARS is a relatively small and consolidated facility. Good safety practices and Occupational Safety and Health Act (OSHA) regulations on worker protection standards mandate that fields that have been applied with pesticide be posted, clearly communicating required re-entry intervals and details on products applied be documented. As experimental pesticides may be exempt from OSHA documentation, we will keep working with researchers so that all pesticide application be posted and notified to appropriate station staff. It is our preference that the chemistry information (such as a.i.) of all products applied be available in case of potential accidents that may put at risk staff or students. We will work with faculty to achieve a suitable level of protection that do not jeopardize research confidentiality when confidentiality is required.

Appendix A: Crop research at the Hancock Ag Research Station in 2017 by field area used



Hancock ARS Research Acres and Percentage of Total Field Research, 2017

Appendix B: 2017 Peer Reviewed Journal Articles Publishing Information Generated at HARS.

Arbizu, C.I., P.M. Tas, P.W. Simon, and D.M. Spooner. 2017. Phylogenetic Prediction of *Alternaria* Leaf Blight Resistance in Wild and Cultivated Species of Carrots. *Crop Science* 57: 2645-2653.

Braun, S. R., J. B. Endelman, K. G. Haynes, and S. H. Jansky. 2017. Quantitative Trait Loci for Resistance to Common Scab and Cold-Induced Sweetening in Diploid Potato. *Plant Genome* 10.

Chung, Y.S., K. Changsoo, and Shelley Jansky. 2017. New source of bacterial soft rot resistance in wild potato (*Solanum chacoense*) tubers. *Genetic Resources and Crop Evolution* 64: 1963–1969.

Colquhoun, J.B., D.J. Heider, and R.A. Rittmeyer. 2017. Seed Potato Growth and Yield as Affected by Mother Plant Exposure to Herbicides. *Weed Technology* 31:136-147.

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Groves, R.L. S. Chapman, L.K. Crubaugh, E. Duerr, B. Bradford, and J. Clements. 2017. Registered and Experimental Foliar Insecticides for Control of Colorado Potato Beetle and Potato Leafhopper in Potato, 2016. *Arthropod Management Tests* 42, Issue 1, 1 January 2017, tsx057, <https://doi.org/10.1093/amt/tsx057>.

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- Kelling, K.A., D.I. Rouse, and P.E. Speth. 2017. Fumigation and Fertilizer Nitrogen Source Effects on Potato Yield, Quality, and Early Dying - *American Journal of Potato Research*, *American Journal of Potato Research* 94: 481–489.
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- Smith, L.C. 2017. Nitrogen Conservation in Perennial Grasses Managed for Bioenergy Production. The University of Wisconsin - Madison, ProQuest Dissertations Publishing, 2017. 10282708.
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Kemp Natural Resources Station

2017 Annual Report

1. Notable Station Achievements

- Supported 7,000 user-days of diverse station activity and provided 3,871 person-nights of lodging;
- Generated outside donations, including:
 - \$10k donation to implement the Hamilton Roddis Memorial Lecture Series; and
 - \$59 thousand in undesignated donations to support general station infrastructure improvements and programming.
- Completed several station improvement projects, including:
 - Updated stairs and landscaping around the fire ring and picnic table areas;
 - Completed landscaping and remodeling of the superintendent's house;
 - Completed lab modernization grant to expand and remodel the shop;
 - Added new safety equipment and air quality equipment to the shop;
 - Improved user access and safety by installing modern docks;
 - Installed water softeners in Mead Hall and office to solve iron problem;
 - Reroofed the machine shed to stop leaking;
 - Completed furnishing and landscaping of the Connor Forestry Center; and
 - Completed over \$8,300 in improvements to station roads and parking areas.

2. Outreach & Instructional Activities, Including Hosted Conferences/Workshops

- **Outreach**
 - Conducted 12 outreach events as part of the Kemp Summer Outreach Series, attracting 372 attendees; this included 4 events in partnership with the Minocqua Public Library. Also, hosted 2 external outreach programs organized by UW-Madison, providing 111 person-nights of outreach lodging;
 - Co-organized and implemented the fourth year of the Science on Tap outreach series (10 events), attracting 1,100 people. Events included a very successful day-long *Agriculture in the Northwoods* field tour;
 - Developed and implemented a monthly radio program called Field Notes that airs on local public radio station WXPB. Program is a joint venture of the Kemp and Trout Lake research stations and it has been very well received;
 - Hosted 3 separate environmental field days for 176 local grade school students;
 - Hosted the Connor Forestry Center Open House for the public to showcase our new classroom/conference center attracting 150 people;
 - Organized the 2017 Hamilton Roddis Memorial Lecture, attracting 700 people; and
 - Prepared 2 issues of *Kemp's Point*, the semi-annual station newsletter that is distributed to over 800 households.
- **Instruction**
 - Supported 14 field classes, involving 5 UW-Madison departments and 3 UW System universities. Provided 880 person-nights of instructional lodging.

- **Conferences/Workshops**
 - Hosted 24 conferences & workshops, providing 430 person-nights of lodging.

3. **Research**

- Supported 42 research projects, involving 38 principal investigators from 10 UW-Madison academic departments and 13 extramural universities/agencies;
- Hosted 5 lab retreats, during which contribution to 11 UW-Madison research projects was made;
- Conducted two research seminars attracting 55 people for the Learning in Retirement Series and the Trout Lake Station Research Series;
- Provided 2,437 person-nights of research lodging;
- Attracted 4 new researchers to the station; and
- Facilitated an incredibly diverse range of projects representing 5 of the 6 CALS Priority Themes: *Bioenergy & Bioproducts*, *Changing Climate*, *Economic & Community Development*, *Health & Wellness*, and *Healthy Ecosystems*.

4. **Change**

- Worked with ARS Admin to converted fixed term finite FMSA, Gary Dalka, to a permanent position in January 2017; and
- Increased appointment for custodian, Lynne Dalka, to accommodate new duties at the Connor Forestry Center.

5. **Goals for the Coming Year**

- Maintain high levels of research, instruction, outreach and conference/ workshop activity;
- Continue to build relationships with Kemp Station personnel, ARS administration, and community partners as the new station superintendent;
- Develop Parking strategies and infrastructure to service the new Connor Forestry Center;
- Convert Mead conference room to two bedrooms to increase sleeping capacity;
- Implement five-year maintenance plan for Kemp Station buildings and infrastructure;
- Implement outreach campaign to attract new researchers to Kemp Station;
- Increase Kemp Station's lodging use by 5%;
- Increase Kemp Station's Connor Forestry Center use by 5%; and
- Foster Kemp Station's relationships of current and new donors.

6. **Areas of Concern & Challenges**

- Avoiding the field station death spiral. Kemp substantially increased its lodging fees in March 2015 and again in January 2016. Researchers have told us we have now hit the tipping point, where they are considering no-cost alternatives such as nearby UW Trout Lake. Fee increase could drive away Kemp users;
- Address \$150k in station maintenance projects, including replacing roofs, replacing decayed structural logs, painting buildings, and replacing sliding patio doors; and
- Address the upcoming cost associated with Kemp Road resurfacing.

UW Lancaster Agricultural Research Station – Report by Arin Crooks

1. Notable Station Achievements –

- a. Providing unbiased research and results in a University setting for producers of the Driftless Region along the Mississippi River including Wisconsin, Illinois, Iowa, and Minnesota. (Lancaster ARS is the only University research station located in the Driftless Region.) Cover crop research at Lancaster continues to provide information for field days, trainings, and publications. Findings so far have included yield data from different species used, impacts of different soil fertility, and the ability to interseed into various grain crops such as corn, soybeans, and winter wheat. Three different research demonstration plots allowed over 130 station visitors to see live and growing examples of the topics presented for the programs. A demonstration video on interseeding cover crops was shared on YouTube from work at Lancaster ARS (<https://www.youtube.com/watch?v=gMKx2NeBmT4>)
- b. Management and Publicity of the Long Term Crop Rotation Study area on station as we eclipsed the 50th anniversary. This is the 2nd oldest crop rotation study in the US. The trial provides continued data to the Soil Science Department as well as other researchers such as Joe Lauer to help produce information on crop performance from things like soil fertility and crop rotation effects. This year we were able to highlight the longevity and the findings of the project that benefits various aspects in agronomy. First we released a podcast with CALS Communications (<https://news.cals.wisc.edu/2017/06/02/50-years-of-rotation-audio/>), which also resulted in several articles in various Wisconsin agriculture newspaper publications. Another story was also written and shared by UW Communications (<https://news.wisc.edu/uw-madisons-lancaster-ag-station-celebrates-half-century-study-of-crop-rotation/>). This fall the story was also selected to be part of the Forward Motion television program for UW Madison and should be televised in the spring of 2018. Incorporated in many of these stories were various UW-Madison and UW Extension staff that are involved at Lancaster ARS as well as a number of local producers relating the impact of the project on their operations. This project is central to the identity and mission of Lancaster ARS as providing different systems approach to find sustainable management practices for efficient crop production while maintaining soil health.
- c. Production and harvest of Kernza, a new and improved variety of intermediate wheatgrass, as a grazing forage, grain, and harvested forage as a beef cattle feed. Valentin Picasso Risso and his lab harvested their first crop from the Kernza that was planted at Lancaster in 2016. During the spring and fall we did short term grazing with yearling beef heifers as part of their crop management. We also harvested the first Kernza grain crop in which some of the seed was utilized for planting additional research projects across other UW and private operations. Earlier this winter the residual forage after combining the grain was also utilized in a beef cow feeding project to demonstrate the ability to include the forage in a dry, gestational beef cow diet. During July the project was highlighted in a field day that attracted over 50 people and garnered interest from other tours and individuals visiting the station. This is some of the first Kernza to be grown and harvested in the Upper Midwest and further research projects are being added for 2018.
- d. Beef herd research with Dr. Brian Kirkpatrick and his “Trio” allele, which is a gene mutation that increases ovulation rate in beef cattle and results in twins and other multiple births. Although the research did not all take place at Lancaster, the Lancaster beef herd has produced the research animals for two Phd candidates to complete their research and attain their degrees. Five different research papers have been published in the last year with another under review for publication. Findings from

the research include identification of the likely causative gene and characterization of reproductive and endocrine performance from animals containing the allele. These results have assisted in Dr. Kirkpatrick receiving a USDA-NIFA grant to further evaluate physiological changes that occur in animals with the allele. This will hopefully complete the understanding of what happens to cause the multiple ovulations and subsequent multiple pregnancies. Potential findings could impact the cattle reproduction industry in other aspects such as improving reproductive technologies in super ovulation and embryo transfer beyond the performance of these individual animals possessing this mutant allele of the gene.

2. Outreach/Instruction Activities Hosted –

- a. UWEX & Michael Fields Institute Cover Crops Field Day and 2 Training Days - 80 people
- b. UWEX Kernza and Cover Crops Field Day– 55 people
- c. UWEX Bull Selection Clinic – 55 people
- d. UW Platteville Crop Production class tour – 40 people
- e. UWEX Integrated Pest Management Update Meeting – 25 people
- f. Wisconsin Technical Colleges Farm Business Management Instructors Tour and Meeting – 25 people
- g. UW Silvopasture Field Day – 10 people
- h. Various other smaller tours and visits

3. Number of Research Projects – (See attached page for project list)

- a. Agronomic Crop Projects – 20 total projects including areas of corn, soybeans, forages, small grains, cover crops, soil conservation, and fertility. 13 different faculty members from 4 different departments.
- b. Beef Cattle and Grazing Projects – 8 total projects including cow/calf genetics, cow/calf reproduction, nutrition, animal health, animal welfare during heat stress, silvopasture, and grazing plant species performance. 3 different faculty from 2 different departments including cooperating researchers from the USDA DFRC, UW Platteville, and a private veterinarian researcher.

4. Changes:

- a. The largest change for Lancaster ARS was the addition of new station staff and different roles for existing staff. With the departure of our Assistant Superintendent in the fall of 2016 and the 2 other crew retirements over the last 2 years, we had multiple positions to replace in 2017. To accommodate changing needs and budget reductions, some new staff titles have been utilized to fill our needs. Our new station management now includes a single Superintendent that oversees the station and individually manages the cattle activities with an Agricultural Projects Supervisor to manage the crop activities and supervise part of the crew. Of our other 5 permanent staff we have 2 new Agricultural Equipment Operators that began in 2017 and the other in 2016. Our Animal Research Technician and University Services Associate remain as long time employees. For 2017 we had 4 out of 7 permanent staff filling new roles and 3 staff with less than 2 years of experience at Lancaster ARS. Luckily we have an excellent group of employees that help each other and successfully continued to serve our researchers and other users at Lancaster ARS. Previously the last 3 new permanent hires at Lancaster ARS had been over a 9-year period. Our staff tends to have very low turnover rate so this was a very different situation for Lancaster ARS in 2017.
- b. Alternate crop species and production methods continue to increase in interest over traditional crop species and management strategies for agronomic and beef cattle areas. In the last few years we have seen a shift to increased utilization of Kernza and other plant species utilized in practices such as cover crops. Lancaster ARS has always maintained activity in alternate crops and especially forages such as Cup Plant, Kura Clover, and Teff grass to support our mission of supporting sustainable

agriculture practices with utilization of crop and livestock production in the rolling terrain of the Driftless Region in Southwest Wisconsin. Other research projects include alternate management strategies such as intensively grazing small grains (Kernza) and wooded areas (silvopasture) that are uncommon to Wisconsin. Another new project request includes a prairie plant area as part of an Extension demonstration project in support of pollinators. Even the current primary research interest in our beef herd is evaluating a novel gene that increasing the ovulation rate and multiple births in beef cattle. Some traditional crop and beef research interests continue, but the Lancaster ARS researchers seem to have more ability for alternative type research projects.

- c. Increased interest in the utilization of Lancaster ARS by other university faculty and private researchers continues as a trend over the last year. Most of these interests are collaborations with CALS faculty, but requests continue to be occurring at Lancaster. We evaluate each request to determine that it doesn't affect our primary mission of supporting CALS faculty and their research needs. Some requests come through CALS faculty and others are made directly to Lancaster. Direct requests to Lancaster that are worthy, we try to pair with the appropriate researchers from CALS. As an example, this fall we were able to support a project for a private animal pharmaceutical company that didn't affect other current beef research. This project was able raise additional funds to support beef research in the Animal Science Department. Another request has just come through about a potential herbicide project for a private company that was brought to us by an Agronomy faculty member. These supplemental projects provide us with additional activity, funds, and exposure to additional user groups that we might not otherwise reach.

5. Goals for the coming year –

- a. Internally our goal will be the adjustment of Lancaster ARS's new staffing structure. For the recent 25 plus years Lancaster ARS has operated with two Superintendents to share station management and individually supervise the beef and agronomic research and production activities. Reorganization with management duties have taken place already and will continue to be formalized over the next year. Continued training of staff in additional duties will occur as our new staff members acclimate fully and our new system of operation settles in.
- b. Cooperate with Mike Peters and the rest of the ARS Headquarters staff to maintain our relationships with CALS faculty, especially in the agronomic related areas. With a new crops manager, we are missing an academic staff level position to relate and communicate local research needs and other benefits of carrying out research at Lancaster ARS. A combined effort of the new Station Crops Manager, Superintendent, and Mike as the ARS Director will hopefully provide an avenue to maintain and increase CALS faculty interest in performing research at Lancaster.
- c. Oversee and accommodate construction of a new machinery storage building that has been needed for many years. Bids are completed and construction is planned for the first half of 2018 with support and cooperation with Chris Velie's office in Facilities, Planning, and Management. This storage facility will replace much of the storage from 2 old wooden barn structures that are quickly deteriorating in physical condition and will need to be removed in the near future. This building will not accommodate all of our storage need from those two structures, but will provide a large portion.

6. Areas of concern and challenges –

- a. Maintaining research interest with new station management structure and decreased number of CALS research faculty. Faculty numbers continue to decrease and eventually that will limit the amount of interest and ability in performing research at all of the Ag Research Stations. Maintaining relationships with existing faculty members and creating new ones with recently hired faculty and others that previously haven't utilized Lancaster will be critical for our station (and other stations too) to maintain our research activity level. The lack of hiring of new faculty and especially those

interested in applied research is a concern for multiple departments that we work with. Continued collaborations for Lancaster with other universities (such as UW Platteville) and private researchers can allow Lancaster ARS to supplement activity level when needed, but primary focus must be maintained on activity with UW-Madison CALS faculty.

- b. Large amount of current openings in UW Extension staff for state specialists and local county agriculture agents. State Extension Specialists have always been active users of all research stations. Positions like the former Beef Extension Specialist position has remained open with no equivalent replacement for several years and with the retirement of the Forage Extension Specialist is another vacancy that will potentially limit interest in research at Lancaster. Current UW restructuring plans could potentially impact hiring and staffing of those vital position types with applied research interests within the UW system. Also Southwest Wisconsin is seeing a shortage of county agriculture extension agents. Current openings in Southwest Wisconsin list four of six counties with vacant positions. Lancaster ARS has always maintained close relationships with area county agriculture agents to utilize the station and assist us with planning and publicizing public events. With such limited staff and lack of experience in those positions will limit the benefits of our cooperation at least for the short term time period.

Marshfield Agricultural Research Station 2017 Achievements

1. Notable achievements

- a. Installed high tensile fencing to increase rotational grazing infrastructure to 100 acres
- b. Began utilizing the practice of interseeding cover crops into V4 corn
- c. Increased research and demonstration of rotational grazing of dairy heifers
- d. Reduced crop inputs – decreased spending on seed and fertilizer
- e. Transitioned to use of custom operator for grain harvest
- f. Purchased and began operating new research plot combine
- g. Built tractor lease program with New Holland/Swidorski Equipment Inc.
- h. Began tractor lease program with Case IH/Chili Implement
- i. Built partnership with McFarlane Manufacturing – research and development of prototype interseeder, use of vertical tillage unit
- j. Received a 3d year Superior Quality Milk award by Foremost Farms USA
- k. Installed 63 Calan gate feeders
- l. Erected a 40'x96' hay storage building
- m. Added 40 additional acres for managed intensive rotational grazing with 90 non-trial heifers on paddock.

2. Outreach and instruction activities

- a. Healthy Soil Healthy Water Workshop, February
- b. Cover Crop & No-till Spring Field & Pasture Walk, April
- c. Fence Building & Maintenance Pasture Walk, May
- d. *Common Ground*, August
- e. Central WI No-tillers: Interseeding Cover Crops Field Walk, August
- f. UW Extension Forage Team Training, September
- g. Mid-State Technical College field classes:
- h. Entered into an MOU with Mid State Technical Colleges to use the station as a teaching lab with staff teaching staff taught 7 classes.
- i. Hosted a 2nd Dairy Breakfast
- j. Provided 42 research farm tours for over 1560 people
- k. The South auditorium was used by 4240 people
- l. MARS provided student work/internships/Youth Apprenticeship opportunities for 10 students.

3. Research activity

- a. 50 field trials total
- b. 121.7 acres (including research pastures)
- c. 16 PIs – including 2 PIs that have never worked at MARS before: Erin Silva and Brian Luck
- d. 22 animal protocols
- e. Livestock research involved 365 animals and 6 PIs
- f. Implemented a new fee structure for private companies using MARS as a resource for alfalfa/forage research trials

4. Change

- a. Began planning for operating approximately 250 fewer acres starting in 2018. Some acres were lost to development while the lease expired on the remaining acres. After it was determined that the additional acres were not necessary for feed production or

manure application, it was decided that operating fewer acres was a good financial decision for MARS.

- b. Discontinued solids bedding use in barns due to poor quality. Meetings with USDA regarding major repairs and/or reconfiguration of manure separator to address manure byproduct quality and manure storage inadequacies are expected to result in further inputs by USDA to fix the system and make financially sustainable.
- c. Low milk and commodity prices will challenge the MARS station budget this year along with the 2% CALS tax and 5% UW system tax.
- d. Discussions are ongoing and favorable for a centralized rearing of UW owned heifers at MARS. Discussions pertain to the raising of Blaine and Dairy Forage Research Center heifers MARS.
- e. Drafted, implemented and reviewed a MARS Forage SOP to guide the process of quantity, cut length, quality, harvest interval, rotation, pre-harvest monitoring, and harvest of station home grown forages.

5. Goals for next year

- a. Focus on minor changes that can be made to improve forage quality and consistency
- b. Further explore alternative ways to achieve optimum forage quality while saving on the budget; this could include replacing some alfalfa acres with other annual forages such as Italian ryegrass or festulolium
- c. Build a multi-function unit to interseed cover crops, cultivate corn, and apply liquid nitrogen in one pass. This will help to achieve continuous living cover in fields, while also providing the opportunity to minimize the use of herbicides. This is an opportunity for MARS to stay at the forefront of soil and water conservation.
- d. Work out the details for raising Dairy Forage Research Center heifers with DFRC and Dairy Science
- e. Continue discussions to coordinate an effort to raise money to build either an administrative office building or visitors pavilion in the name of Thomas R. Drendel.
- f. Partner with stakeholders in Marathon County and Central Wisconsin to continue the work of the successful *Common Ground* event (held August 10, 2017 at MARS). A second annual event is being planned.
- g. Prepare MARS livestock facilities to successfully undergo the fourth AAALAC (Association for Assessment & Accreditation of Lab Animal Care) certification as part of CALS.
- h. Submit an application for a 2018 National Milk Quality Award as MARS milk quality is on par with achieving Platinum award level.

6. Areas of concern and challenges

- a. Low milk and commodity prices; the lowest balance we have seen on our 136
- b. Uncertainty of knowing if MARS can produce all feed needs on current acreage.

1. Notable station achievements:

Soil Science

Evaluated dozens of fertilizers and fertilization strategies for maximizing turf performance under a variety of conditions

Evaluated dozens of herbicides for weed control

Continued refining our unique growing degree day model for determining ideal re-application intervals for plant growth regulators

Continued a long term study on potassium nutritional requirements that is changing the way potassium is applied to turfgrass worldwide

Evaluated dozens of different grass species and cultivars for performance under Wisconsin's unique climate conditions

Began a new trafficking model to do turf variety research while exposing the plots to a trafficking machine to simulate having a football game played on it

Continues to study Biological Turf products for efficacy

Began to take data from a Kentucky Bluegrass NTEP (National Turf Evaluation Program)

Seeded a second NTEP trial with data collection to begin in 2018

Investigated the use of wetting agents to better utilize water in putting green management

Plant Pathology

Researched a predictive model for dollar spot at the OJ Noer for 10 years. This model was released publicly in early 2018 and has the potential for widespread adoption around the country to better predict fungicide applications.

Researched numerous bio-fungicides and other alternative, low toxicity products for disease control on turf in the hopes of increasing the sustainability of turfgrass disease management.

Tested hundreds of different disease control products to provide turfgrass managers from around the Midwest the most up-to-date disease control recommendations.

Initiated research investigating the impacts of fertilizer and pesticide applications on the turfgrass soil microbiome. This project is part of a collaborative research effort with other universities to gain an improved understanding of the important soil microbial community.

Diagnosed 236 turfgrass samples from around the country in 2017

Entomology

Evaluation of novel chemistries for control of Japanese beetle adults on roses

Aim is to find products that are pollinator friendly

Evaluation of novel chemistries for control of surface feeding caterpillars in turf

Aim is to find products that are pollinator friendly

Evaluation of several wetting agents on low-cut creeping bentgrass

Aim is to assess potential phytotoxicity to highly maintained turf

Accomplishments

Complete renovation of for research plots, including removal of old irrigation, data collectors and markers. Installed new irrigation to multiple plots with and buried wires to connect those new plots to the existing automatic irrigation computer

Upgraded the computer system in the ARS office and improved the irrigation computer for the irrigation system

With the assistance of the Wisconsin golf Course Superintendents Association and the Wisconsin Turfgrass Association raised funds to erect a 30' x 40' cold storage building with cement floor and electrical service.

Working with two irrigation consultants began to study options to overhaul the existing irrigation system to improve efficiency and performance

Worked with John Deere in negotiating the use of a large area mower to improve the appearance of the overall grounds and improve efficiency

2. Outreach/instruction activities:

- WTA Summer Field Day – 287 attendees
- Grandparents University – 45 attendees
- Madison Landscape Contractor – 48 attendees
- Ag Teachers and Counselors Tour – 24 attendees
- Dr. Koch taught Hort 262 lab for 10 weeks with 8 students
- Plant Pathology 559 summer student tour 15
- Cross Plains Garden Club – 36 attendees

3. Research Activity:

Listed Below

4. Change:

Plant Pathology maintains a diagnostic lab at OJ Noer, with a lab manager

5. Station goals for the coming year
 - Develop a plan for better communication between all participating parties
 - Active involvement in the road construction project on Cty Hwy M
 - Work out a streamlined process for hosting Golf Channel and Incident Command during the AM Fam Senior Championship
 - Work toward refurbishing the irrigation system around the main building
 - Continue to work with Dr. Williamson of maintenance of ‘Operation Pollinator’ demonstration
 - Continue to procure donations of seed, fertilizer, pesticide and as many additional supplies as possible
 - Pursue acquisition of new or better research and maintenance equipment, large area mower, topdressing brush
 - Work with PI’s on better follow the Respirator and Hearing Policy created in conjunction with UW Safety
 - Continue to assist researchers to install as many new projects as possible
 -
 - Create an outreach program to show the value of turfgrass in the local area with seminars to various groups like, Kiawana, Rotary and Master Gardener groups

6. Areas of concern and challenges
 - Researchers used to financially contribute more towards operations and needed equipment at the facility, but with budget cuts, they contribute for unbudgeted needs. A historical Noer spreadsheet showing this trend is available.

2017 Project Master List

Title of Project	Project Leader	Plot #s
\$ Spot (Fairway)	Koch	A45.A48
Nitrogen for dollar spot control	Koch	B-9
Preventative control of Pythium blight	Koch	C-5
Anthracnose	Koch	A-52, Pleasant View
Seasonal disease control - putting green	Koch	B-16
Dew Effect of Dollar Spot	Koch	B-24
Fertilizer/ Dollar Spot	Koch	B-23

Brown patch	Koch	C-27
Microdochium Timing Trial	Koch	C-31
Biological Dollar Spot Green	Koch	B-7
Dollar Spot	Koch	A-54
Early Season Dollar Spot	Koch	A-50
Long Term Dollar Spot	Koch	C-30
Leaf Spot	Koch	Pine Hills
Water Quality	Koch	B-10
Reduced risk weed control, EIQ	Koch	A-26, A-32
Winter Degradation	Koch	B-22
Mycro-biome	Koch	C-6
Summer patch	Koch	A-59
Phyto-biome test	Koch	C-29
Precision Disease Management	Koch	A-47
Microdochium Patch	Koch	B-26
Nitrogen Source	Soldat	B-19
Biological Product Trial	Soldat	B-17
CGI	Soldat	B-31
Low Input Turf	Soldat	A-11
Growth regulator evaluation	Soldat	A-57, A-58
Potassium Soil Test Calibration	Soldat	B-6
Home lawn species and management trial	Soldat	A-6,7
	Soldat	
Organic Fertilizer Trial	Soldat	D-11
NTEP Kentucky Bluegrass	Soldat	D-22,23,24,26,27
NTEP Fine Fescue	Soldat	A-12
PGR	Soldat	B-25

Sports Turf Grass Selection	Soldat	B-18
Zoysia Buffalograss seed timing	Soldat	D-21
DOT roadside mixtures	Soldat/Renz	D-28
Spring Valley Fertilizer Trial	Soldat	D-10
Helena Fertilizer Evaluation	Soldat	D-18,19
Cutworms	Williamson	B-27, B-30
Heritage Seed Demo 2014	Schweiger	A-5
My Holiday	Schweiger	A-19
Pollinator Demo	Schweiger	A-1,15,16,17
Carbon Sequestration	Jackson	D17,20

Challenges for the coming year

Over the next two years County Highway M that services the O.J. Noer Turfgrass research Facility will be under construction. The large equipment and the soil movement will create havoc and some concern for water movement issues and accessibility to the site at all times. Many areas of the property will be effected and changes to the “normal” operations will be required. At the completion of this project a new facility sign will need to be designed and installed, but until then there will be no signage for those travelling to the property.

Peninsular Agricultural Research Station – 2017

February 20, 2018

Superintendent: Matt Stasiak

Notable station achievements

This was the eighth and final year of data collection for the 2010 NC140 Apple Rootstock Planting. This is one of four NC140 cooperative research trail plantings on the station, all replicated at other sites throughout North America. Other plantings include the 2014 Apple Rootstock, 2015 Organic Apple Rootstock and 2017 High Density Tart Cherry. Summaries of these trials are typically published at the half way point and then a final report on completion after 8-10 years of data gathering. Five and six year summaries for the 2010 planting were published this year in the Journal Amer. Pomological Society and Compact Fruit Tree - Journal of the Intl. Fruit Tree Association.

Station PI established an irrigation performance study with funding from the WI Cherry Growers evaluating the same Michigan State University clonal tart cherry rootstocks being tested in the 2017 NC140 High Density Tart Cherry trial. Although not a nationally replicated trial, this study will contribute to the objectives of the NC140 Research Project by examining stress related interactions on tree growth and performance.

The station provided research planting support for Plant Pathology wine grape disease susceptibility evaluations and the first season of testing a reduced fungicide spray program on the popular wine variety Marquette.

For a second year, continued management trials evaluating efficacy of selected insecticide control programs for spotted wing drosophila in tart cherry. This invasive insect pest continues to disrupt IPM programs resulting in control failures and crop loss with the potential to economically devastate cherry growing in Wisconsin.

United States Potato Genebank supplied germplasm orders in 2017 to 229 domestic recipients in 35 states and 17 foreign orders to 9 countries. These went to support efforts in breeding, genetics, home gardeners, pathology, physiology, entomology, taxonomy and education.

Outreach/instruction activities

- Provided Station and Potato Gene Bank tour and lunch for Washington Island School (35 participants).
- Hosted Door County Environmental Council *Organic Sustainable Farming Trolley Tours* (40 participants).
- Hosted Door County Master Gardeners annual plant sale (450 visitor/customers).
- Hosted Door County Master Gardener Annual *'The Garden Door' Open House* and station tours (400 attendees).
- Hosted Door County Master Gardener Annual *Door County House & Garden Walk* (556 attendees).
- Hosted 3 Door County Master Gardener *Tuesday in the Garden* educational programs (75 attendees).

- Door and Kewaunee County Extension Committee, presented *2017 Peninsular Research Station Activities Report* (12 participants).
- Presented research results at WI Fresh Fruit & Vegetable Conference (200 participants)
- Hosted Door County Extension Agent *Vineyard Walk* (8 participants).
- Provided station tour for UW-Extension Chancellor Sandeen (6 participants).
- Organized *Winter Cherry Season Review Meeting* for commercial producers (30 participants).
- Presented *Cherry Pest Update* as invited speaker at the Annual WI Cherry Growers Dinner (55 participants).
- Presented ‘*Care of Young Orchard Trees in Replant Sites*’ and ‘*Apple Rootstock Update*’ at the 2017 Great Plains Growers Conference, Saint Josephs, MO (100 participants).
- Provided 20 weekly seasonal PARS webpage *Commercial Fruit Pest Updates* for apple & cherry producers.
- Coordinated commercial apple and cherry scouting program covering 240 cherry & 180 apple acres (eight producers), delivered over 100 seasonal pest reports.

Research Activity

- 8 Tart cherry: 4 PARS, 2 Entomology, 1 PARS/Horticulture, 1 private contract
- 6 Apple: 5 PARS/Horticulture, 1 PARS
- 5 Small grain: 5 Agronomy
- 3 Grape: 3 Plant Pathology
- 1 Potato: NRSP-6: United States Potato Genebank

Change

The Station Superintendent will be retiring at the end of 2018.

Station goals for the coming year

- Continue to encourage apple hard cider research collaboration with Horticulture faculty. We are again seeking grant funding to support maintenance of PARS apple cider variety trials, laboratory juice quality and finished cider evaluations.
- Continue to support the latest stage of Plant Pathology faculty disease susceptibility and management research trials for northern wine grapes along with testing new reduced disease management strategies incorporating recent susceptibility and resistance findings.
- Continue efforts with Entomology faculty in efficacy testing of economically viable pest management strategies to control Spotted Wing Drosophila. We will also provide graduate student research project support and industry outreach efforts related to this pest.
- Encourage and support small and perennial grain research conducted by Agronomy faculty.

Areas of concern and challenges

The retirement of the current station superintendent at the end of the calendar year will necessitate a department/college decision regarding the nature of a replacement and how the transitioning of administrative, research and outreach responsibilities will be managed.

Rhineland Agricultural Research Station (RARS) 2017 Annual Report

Notable Station Achievements:

- 1) The research impacts of RARS are best quantified through the seed that is produced on the farm, rather than through the trials conducted there. Seed potatoes from RARS contributed to the following 2017 publications and presentations by the research group of Assistant Professor Jeffrey Endelman, from the Dept. of Horticulture:
 - Wang Y, Snodgrass LB, Bethke PC, Bussan AJ, Holm DG, Novy RG, Pavek MJ, Porter GA, Rosen CJ, Sathuvalli V, Thompson AL, Thornton MT, Endelman JB (2017) Reliability of measurement and genotype x environment interaction for potato specific gravity. *Crop Science* 57:1–7. doi:10.2135/cropsci2016.12.0976
 - Endelman JB (2017) Improving selection in potato breeding, International Conference on Selection Theory and Breeding Methodology, March 24, Freising, Germany
 - Endelman JB (2017) Improving selection in potato breeding with genome-wide markers, Dept. Soil and Crop Sciences, March 30, Colorado State University
 - Caraza M, Endelman JB (2017) Using image analysis to quantify skin set and color in red potatoes, Potato Association of America Annual Meeting, July 24–26, Fargo, ND
 - Schmitz Carley C, Endelman JB (2017) Genome-wide selection accuracy in tetraploid potato F1 populations, Potato Association of America Annual Meeting, July 24–26, Fargo, ND
 - Endelman J, Schmitz Carley C (2017) Combining marker and pedigree information for genome-wide prediction in potato, 20th Triennial Conference of the European Association for Potato Research, July 9-14, Versailles, France
 - Schmitz Carley C, Endelman JB (2017) Genomic selection in tetraploid potato, Annual Meeting of the National Association of Plant Breeders, Aug. 8–9, Davis, CA
- 2) Foundation seed of W8893-1R and W9133-1rus was released to growers for Spring 2017 planting through the SpudPro program. Both varieties were initially selected and subsequently maintained at RARS
- 3) Two new varieties were disclosed to WARF at the end of 2017: W8890-1R and W9742-3rus
- 4) Acreage of the new chip processing variety Hodag (named after the town mascot of Rhineland) continues to increase, from 21 acres in 2016 to 88 acres in 2017
- 5) Over 18,000 lbs of seed from RARS, covering 35 varieties, was distributed for trialing to 25 public and private cooperators across the US and Canada
- 6) Passed a DATCP conduct audit, met all new 2018 WPS regulatory standards for training, protection, and mitigation

Outreach/Instruction Activities:

- 1) We supported outreach and education by hosting the following:
 - Five middle/high school groups ranging from 8-15 participants
 - Group from Myanmar (2 growers, 2 breeders, and a representative from the chip industry). Myanmar currently is trialing 4 WI varieties: Hodag, Pinnacle, Nicolet, and Megachip
- 2) RARS hosted, in cooperation with the Wisconsin Potato and Vegetable Growers Association (WPVGA), Trig's Food, and our area Food Pantries, "A Night on the Farm – Helping Fight Local Hunger" event
 - 200+ volunteers picked 6.5 tons of potatoes that provided food for several local area food pantries
 - Collection of non-perishable food items
 - Televised and advertised locally
 - Trig's Foods, A-1 Septic, Rhineland Food Pantry major sponsors
 - The WPVGA provided the WI Spudmobile
- 3) Provided support of research projects outside of the potato breeding program being conducted at the Rhineland Station

- Collaborators included other UW-Madison departments and system universities, Michigan State University, DNR, and DATCP
- 4) Developed a close working relationship with:
- Case IH/Beaver Machine to seamlessly execute 2017 equipment needs
 - Local U.S. Forest Service to coordinate and share staff and equipment resources
 - AgSource, Insight FS, and Great Lakes CPS to build, maintain, and improve soil fertility and overall success of our potato, oat, and clover crops

Change:

The breeding program continues to grow and evolve each year. This year was no exception, with my promotion to Superintendent, hiring of new employees, and implementation of new planting designs, operating procedures, and research plot harvester.

- 1) Continue to work on:
- Building a healthy, inclusive, and engaging work environment
 - Encouraging staff to produce measurable results and implementing value-added practices
 - Staff addressing issues as they arise and finding a solution
 - Efficiently utilizing resources to complete tasks in a timely manner
 - Encouraging staff to take on an individual leadership roles
 - Promoting staff participation in professional development activities
- 2) Team objective:
- Successfully complete the Potato Breeding Program goals set by PI and CALS
 - Creation of a world-class breeding program
 - Effectively carry out and support any additional research based at the Rhinelander Station

Improvements:

Even with all the 2017 budget constraints and challenges, we managed to move the research program forward, make improvements to the Station, and explore ways to become more efficient. Major improvements of the Station included:

- 1) Improved tactics to mitigate disease for high-quality, disease-free seed production
- Employed stringent tuber indexing and roging strategies to maintain breeding program integrity. Clones with >10% virus are dropped from the program
 - Did not bring back to RARS any off-site potato tuber material for post-harvest evaluations. All post-harvest evaluations were completed at the Hancock Ag. Research Station. Although time consuming, this change in protocol improved the “cleanliness” of our breeding program
 - Secured donation for on-station field fumigation needs for second year in a row
 - Stayed current on disease/insect forecasting and implemented the use of a weekly crop scouting agency to monitor insect/weed/disease pressure throughout the season
 - Ability to forecast allowed for proper and timely management decisions
 - Purchased a number of plastic pallet boxes to replace the current wood pallet box inventory
- 2) Continued to build on-farm sustainability for long-term success
- Utilized AgSource for assistance with building, maintaining, and improving soil fertility and crop growth
 - Second year of having worked with Insight FS for variable rate fertilization on our Tower fields
 - Worked with WI DNR to assess water usage and maintain compliance

- Employed new technologies to assist with farm management decisions, including use of MSU weather station, learning ArcGIS to assist with locating our FY1 material and track all on-farm activities more comprehensively
- 3) Implementation of new technologies to reduce waste, simplify procedures, and save time
 - Use of tablets for electronic data capture in the field, greenhouses, and storages significantly reducing time and errors associated with data entry
 - Use of thermal printer purchased in 2016 allowed for rapid and accurate printing of pot stakes and slip-on tags for crates in storage and during planting
 - 4) Continued to make improvements to the Station facility to effectively carryout daily operations
 - Coordinated upgrades to the phone and internet connectivity to support the on-goings of daily operations
 - Installed four transition stations throughout Station to be able to use a PTO-operated generator (gifted from the Marshfield Station) during power outages
 - 5) Continued to update and improve planting and harvest equipment, pivots, and greenhouse infrastructure and irrigation
 - Purchased a new single row harvester to facilitate the harvest of all FY3+ potato breeding material without labor from the WI Dept. of Corrections
 - Secured the funds to make significant improvements to our potato planter that gave us the capability to
 - i) Use dry fertilizer impregnated with systemic insecticide in-furrow for crop protection at planting
 - ii) Apply liquid fungicide in-furrow, at planting to maintain seed piece integrity
 - Made substantial improvements in the headhouse of GH#4 to solve rot and interior surface mold issues
 - Purchased and installed a proper containment vessel for the diesel tank at the Tower Field

Goals for the Upcoming Year:

- 1) Efficaciously complete breeding goals set by PI and CALS to continue to strive for the creation of a world-class breeding potato program while retaining UW Agricultural Research Station success
 - Grow a healthy, disease-free seed crop starting at hybridization to the sowing of our true seed through FY5+ seed production
 - i) Help ensure the varieties produced are true to name and type and are below tolerance limits for common potato diseases through a process of tuber indexing and roguing
 - Continue to collect reliable data throughout the growing season, at harvest, and during post-harvest evaluations for all Station research projects
 - Continue to find ways to enhance our sanitation program to assure zero risk for contamination
 - Collect botanical data for Plant Variety Protection applications
- 2) Continue to provide key information and support opportunities for improving greenhouse and field efficiency
 - Continue to update and improve planting and harvest equipment, pivots, and greenhouse infrastructure and irrigation
 - Continue to look at new and improved technologies to assist with healthy crop management, e.g., ArcGIS, Canopeo, Wisconsin Irrigation Scheduler Program (WISP)
 - Continue to establish and document improved lab, field, and greenhouse procedures, protocols, and timetables to ensure uniform and high-quality research
- 3) Increase awareness of the Rhinelander Research Station and the important role it plays in potato variety development internationally, nationally, and regionally

- Host a successful Rhinelander Ag. Research Station Field Day August 2, 2018
 - Host another well attended and highly promoted “A Night on the Farm – Helping Fight Local Hunger” event
 - i) Continue to obtain a yearly sponsor commitment from WPVGA, A-1 Septic, and Trig’s Foods
 - Continue to maintain good working relationships with all University cooperators and individuals within the potato industry community
- 4) Make a positive impact on the Rhinelander Station and CALS by supporting new avenues of research
- Continue to provide support of numerous research projects outside of the potato breeding program conducted at the Rhinelander Station. Collaborators for 2018 will be:
 - i) West Madison Station – Fungicide evaluation on post-harvest vase life of fresh cut flowers
 - ii) Great Lakes Bioenergy – Native grass research
 - iii) Michigan State University – Weather station and drone research
 - iv) DNR – Logging operations and water usage strategies to drive sustainability and compliance
 - Continue to promote facility tours and seminars and be resourceful using the facility grounds as an ideal public gathering place for local events
- 5) Maintain a safe work environment
- Goal of 100% audit compliance
 - Being a leading example among the ARS stations
- 6) Work with Farm Manager to find ways to decrease field and greenhouse expenditures

Areas of Challenges and Concern:

- 1) Keeping the Station performing at an efficient and successful level while continuing to deal with the challenges of old facilities and the implementation of new technologies with limited technical staff
- Over the last three years, the breeding program has been expanded beyond “conventional breeding” and is transforming into a more technical program
 - Imperative that all staff take the initiative to comprehensively learn the methods and modes of operation. This includes
 - i) Having a good understanding of the projects as it pertains to the potato breeding program
 - ii) Conception of Station research outside of the potato breeding program
 - iii) Staff utilization of computers, tablets, and technology to streamline or simplify procedures saving time and increasing efficiency
 - iv) Cross training of staff
 - RARS continues to utilize LTE and temporary assistance when necessary to advance the breeding program as well as other Station research

Spoooner Ag Research Station

2017 Report

Phil Holman, Superintendent

7. Notable station achievements:

The Spooner Ag Research Station hosted 22 agronomic or horticulture research trials for 13 different principal investigators. Eight of the trials were variety testing for the corn grain, corn silage, soybean, oats, and barley variety testing or development programs. Variety trial results are disseminated statewide through UWEX publications, internet sites and two state farm newspapers. Varieties were also tested in switchgrass and big bluestem for biomass production and non-GMO food-grade soybean testing for white mold resistance. Soil fertility trials were conducted in irrigated corn, corn after cover crops, alfalfa and soybeans.

A major new project this year to the Spooner Ag Research Station was the Julie Dawson “Seed to Kitchen” organic vegetable variety trial. Tomatoes, peppers, cucumbers, squash, melons, potatoes, kale, onions, beets, and carrots had varieties tested. These trials test not only vegetable yields but also harvest quality and the produce is further tested by chefs for taste and end use suitability. Separate from the vegetable trial is the demonstration garden in conjunction with area Master Gardeners and UWEX. The demonstration garden is a focal point of activity and awareness within the community. A large field day is held each August that attracts 200-300 people.

This was the first year without the dairy sheep at the Spooner Ag Research Station. The sheep were sold in the fall of 2016, and a major activity this year was the October auction for sheep related equipment and other non-used items. Prior to the auction, the tarp barn was taken down and given to the Hancock ARS. HARS reconstructed it to be used for equipment storage. Additionally, Todd Taylor from the Arlington Sheep Unit purchased some sheep related equipment. Proceeds from these sales are being used for continuing operations here at the Spooner Ag Research Station in the agronomy and horticulture research areas. Sheep buildings are being utilized now for machinery storage, which previously had been stored outside.

Another grain storage bin was constructed by station staff to accommodate timely grain harvest. Commercial storage or grain sale locations are over 30 miles from SARS, so “harvest time” hauling is both difficult to find and impractical. On-station storage allows for capturing higher sale prices in the spring and flexibility in hiring trucking services.

Also of note, was the staffing reduction from having sheep to without sheep. Staff was reduced by 2+ full-time people so agronomic activities were impacted because fewer staff were available to cover certain jobs. SARS did have four station summer student interns. Three of the students worked on the vegetable trial and demonstration garden and one student assisted with agronomic research and production.

8. Outreach/instruction activities:

SARS hosts many groups and individual visitors. I lead some groups and frequently presented information about SARS and SARS research to groups off station (# participants).

- SARS host for UWEX Twilight Garden Meeting (300)
- SARS host Seed to Kitchen Project Field Meeting for Fresh Market Vegetable Growers (35)
- SARS host led/presented SARS research at Cover Crop Field Day (25)
- Overview of SARS Pesticide Safety Equipment for Local PAT class (15)
- Local Agronomy/Soils Farmer Group Planning/Needs Listening Session (12)
- Stop site and station overview presentation at Chippewa County 4-H Youth Tour (50)
- UW-River Falls Forages class tour and research education (30)
- Host site for Tractor Safety training utilizing SARS tractors and implements, teach 1 hour (12)
- Contribute articles for UWEX quarterly newsletter
- Considerable (daily) use by UWEX Ag Agent and UWEX clientele

9. **Research Activity:**

Joe Lauer, Agronomy, Wisconsin Corn Grain Variety Trial (Dryland, Silt Loam & Irrigated)

Joe Lauer, Agronomy, Wisconsin Corn Silage Variety Trial (Silt Loam & Irrigated)

Shawn Conley, Agronomy, Wisconsin Soybean Variety Evaluation (Silt Loam & Irrigated)

Damon Smith, Plant Pathology, White Mold Evaluation of Short Season Soybean Breeding Lines

Damon Smith, Plant Pathology, Spring Wheat Fungicide Impact on Yield and Disease Monitoring

Lucia Gutierrez, Agronomy, Oats and Barley Variety Breeding Line Trial

Erin Silva, Plant Pathology, Organic Soybean Demonstration into Winter Rye

Carrie Laboski, Soil Science, Irrigated Corn Nitrogen Rate Verification Trial

Carrie Laboski, Soil Science, Soybean Yield Response to pH Level (pH plot area)

Matt Ruark, Soil Science, Fall 2016 Seeded Cover Crop Impact on Corn Nitrogen Rates

Matt Ruark, Soil Science, Fall 2017 Seeded Cover Crop Impact on Corn Nitrogen Rates

Mike Casler, USDA Dairy Forage, 2016 Switchgrass and Big Bluestem Hardiness Evaluation

Mike Casler, USDA Dairy Forage, 2014 Switchgrass and Big Bluestem Variety Trial

Yonna Newman, UW-River Falls/UWEX, Forage Crabgrass Demonstration Plot

Erin Silva, Plant Pathology, NOVIC Vegetable on-farm Testing

Julie Dawson, Horticulture, Seed to Kitchen Vegetable Variety Trials

Mosaic Company, Boron/Potash Product Evaluation on Alfalfa Yield

?? no researcher but still harvesting, High Tunnel Season Extension for Fall Bearing Raspberries

Kevin Schoessow, UW-EX Ag Agent & Area Master Gardeners, All America Display Garden

Jason Fischbach, Ashland/Bayfield UW-EX, Willow and Poplar Replant Demo

Jason Fischbach, Ashland/Bayfield UW-EX, Hazelnut Production Trial

Kevin Schoessow, UW-EX Ag Agent, Garden Demo of Wine Grapes

10. **Change:** (explanations in station achievements #1)

- Seed to Kitchen Vegetable Trial
- First growing season without Dairy Sheep
- More cash grain production rather than forage production
- Built more grain storage

11. **Station goals for the coming year**

- Increase number of agronomic research trials
- Explore different crops and cropping systems to reduce costs or increase income
- Return remaining sheep pastures to cash grain production and remove sheep fencing

12. **Areas of concern and challenges**

- Uncertain/limited university support financially
- Challenge of relying on student interns
- Uncertainty of future UWEX changes (with close relationship with Area Ag Agent)

US Dairy Forage Research Center 2017 Annual Report

Leading the world in integrated dairy forage systems research

Number of Research Projects:

During 2017 we supported 4 USDA primary researchers, 1 UW researcher and various collaborating scientist. The collaborating scientist were from within USDA and UW along with visiting scientist from other institutions from around the world. These scientists performed 9 dairy research trials in various areas in support of the DFRC vision. Using a new method of tracking available research stall days our research facility was 38% full (table 1). There were also agronomic trials ran on low lignin alfalfa, BMR sorghum and experimental work on inter-seeding alfalfa in corn silage plots. This is one less dairy animal trial and a slight decrease in agronomic trials compared to 2016.

Our dairy research continues to emphasize new opportunities for improving the efficiency of milk production and ways to improve effective use of our feed, water and land resources. A relatively new area of research at the farm involves genome level research of rumen bacteria along with mammary and liver cells obtained through surgical biopsies.

Outreach:

DFRC hosted 12 groups of visitors with a total of approximately 300 people. This was a very diverse set varying from local 4th graders to tech school students, U.S. bankers, local and international crop genetics salesmen and a German researcher/farmers group. We also hosted an ARS Lead Worker training program. These tours were led by UW and USDA staff and researchers. Areas of emphasis varied from where the food on grocery store shelves originates to potential careers to managing commercial forage production.

DFRC joined the Professional Dairy Producers (PDPW) industry organization and were able to send employees to a few of their sponsored training and information programs.

Challenges:

DFRC, along with the whole milk production industry, faced the challenges of lower milk prices and tightening labor markets. We were fully staffed most of the year with the current staff filling in when necessary. This was a good experience in team building and proved to management that our people are capable of stepping up when needed.

Accomplishments and Goals:

DFRC was successful in their 2017 goal of increasing our pregnancy rate. Our milk production is still lower than we want. We added a small group of Jersey cows to the available research population late in 2017. The

DFRC team will continue to work on bringing herd performance levels back to industry leading levels. We will be using our genomic information to increase the genetic level of our herd with selective culling and mating. We will also be working on employee retention and, through training, increasing the knowledge and performance of our team. Completing a review of our farm SOPs and getting in place a more accurate system of tracking our adherence to these protocols.

Table 1

Trial ID	No.of animals	Animal type	Date Started	Date Finished	Trial Days	Research Stall Days
KFK05	20	multiparous cows	Dec-17	Apr-17	122	2,432
KFK06	48	multiparous cows	Apr-17	Jun-17	61	2,918
KFK07	48	multiparous cows	Aug-17	Oct-17	61	2,918
KFK08	76	multi-and-primiparous cows	Nov-17	Dec-17	61	4,621
GIZ06	8	multi-and-primiparous cows	Jan-17	Mar-17	61	486
GIZ08	56	primiparous cows	Aug-17	Nov-17	122	6,810
GS2 – Chambers	60	heifer calves and 18 bull calves	Jan-17	Dec-17	17	1,020
		Totals			503	21,206
		% of Available Space Used				38.2%
		Available Research Location			Available spaces	Available Research Days
		Grow-Safe stalls			24	8,760
		D Barn Stalls (not Grow-Safe)			74	27,010
		E Barn Stalls			72	26,280
		Fresh cow Stalls			-30	(10,950)
		Chamber Stalls			12	4,380
		Totals			152	55,480

2017 West Madison ARS Annual Report

The 2017 season was very productive and efficient at WMARS. Rainfall was plentiful all season except September which fostered corn silage harvest but may have reduced some soybean yields; it was challenging to make hay all year. Unfortunately on our grounds, emerald ash borer was found and 20 white ash trees were affected: 12 trees were removed and 8 others are being treated with injected insecticide by certified arborists.

1. Notable station achievements

Successful outcomes were noted in many places. The \$100K biomass dryer facility upgrade is nearly complete. Two of three antiquated units had new furnaces installed late season and a donated (outside) seed dryer was renovated and converted to natural gas for 2018 use. Dryer booth door and floor upgrades have been completed. Three drinking water fountains were installed around the station to provide potable water. Exterior lighting around the grounds were repaired/replaced. A sorely needed gravel road was laid down for the many research teams that use the organic fields daily so that access is much better. We relocated the organic mobile hoop house prototype for the 2nd time since it was built in 2014 and we learned that the wooden base will need an overhaul soon. Mapping software (ArcMap, SMS) was utilized to establish more thorough electronic records and field acreage while precision ag data began to be collected/mapped with SMS.

Several crops were produced for livestock/research on campus. This included making 745, 780, 48 and 36 ton of high quality haylage, corn silage, hay, and straw respectively. Approximately 17,500, 9,000, and 4,000 bu of corn grain, soybeans, and small grains, respectively, and 3 tons of grapes were also produced on the station. Twelve tons of produce generated from the organic veggie research and garden plot were donated to local food bank network. Weed control across the station was excellent and a fall burndown program was implemented. We continued to upgrade soil conditions on most of the station's acreage with custom lime application and manure, compost, and fertilizer applications per soil test recommendations. Crops, especially forages responded immediately with 20% less acres needed to meet forage demand. Hundreds of trips to campus with the large straight trucks were successfully accomplished with no accidents/collisions/manure spills. Furthermore, over 90 other trips with the livestock trailer safely handled 2,845 animals, mostly pigs. Over 2,300 tons of manure and 200 tons of campus food plus 250 tons of greenhouse waste were managed and distributed as raw or as compost this year. Compost sales from leaf/manure mixture exceeded \$7800.

2. Outreach Instruction/Activities

Numerous people of all ages were impacted by activities in 2017. The estimate of daily visitors strolling through the gardens was 2,070 people. We established/maintained/displayed over 4,000 annuals and hundreds of perennials in the gardens which provided a scenic backdrop for guided tours to several garden clubs, garden enthusiast, and youth groups that reached 271 people. UW instructional activities numbered 20 events and included BSE, Horticulture, Master Gardeners, and Active Learning Program ('Ropes' course); reaching over 1,000 students. Four field day events were offered: the Commercial Flower Growers of WI Field Day; the annual Horticultural Open House/Field Day; the National Sustainable Ag Coalition, and the Organic Vegetable Research Showcase that summed up to 333 visitors. Collectively, the station's field days, tours, instruction, and conference room users totaled over 5,048 people that were exposed to WMARS in 2017. Our website obtained over 9,600 viewer hits.

3. Research Activities

Of the total 84 projects from 41 PIs, there was an estimated 71 field trials from 28 PIs (56 grad students), 10 teaching projects from 8 PI, and 5 livestock projects from 5 PIs. Over 220 students, staff, post-docs etc. from these programs used the station/facilities this season. The primary research was for plant breeding/research nursery activities and variety trials, and these projects utilized 89 acres primarily with corn, small grains, and vegetables. The 30a of certified organic land includes over a dozen vegetable types, (including 'plants under

plastic', i.e. hoopouses), field crops, cover crops and many access roads. Plant Pathology research included grapes and organic veggies. Fruit research is focused on local production of wine and table grapes to promote cold-hardy cultivars and most grapes were sold to local/regional wineries. West Madison maintains pollinator habitat (buffers, alfalfa, gardens) for bumble bee and honey bee research for Entomology and USDA researchers. Hazelnuts (130 of 300 plants put in to date) were established by BSE to assess productivity and mechanical harvesting and mint distillation was ongoing. Four other BSE faculty used the station to teach their students to build and test prototypes and to learn tractor and equipment operation via driving demos during chopping corn silage and fall tillage. We also transported equipment to/from campus BSE lab for Farming Short Course. Indirectly, livestock research projects (on beef and dairy cattle, goats) at Charmany's vet school and campus' DCC, the Livestock Lab, Vet School are dependent upon WMARS production and livestock hauling for classes.

4. Change

Renewed effort on composting organic waste has been employed and the cost of production was assessed and as such, we increased price by 60% and addition 40% increase will happen before April. Also, to meet certified compost standards, temperature, moisture and turning data logs have been initiated to certify the compost has reached pathogen-killing temperatures (130-140°F for 15 consecutive days) and has adequate moisture, porosity and aeration for efficient microbial activity. Nutrients and C:N ratio data are also being collected on the compost to help determine fertilizer replacement value rates. Also, sharing resources with Bruce Schweiger, Lynn Hummel, Mike Bertram, Arin Crooks, and Mike Stanek wasn't easy but the crew maintained efficiency with a friendly demeanor.

5. Goals for the coming year

1) Continue to implement minimum tillage. We managed ~ 53% of crop acres as no-till. However, manure management and low residue seedbeds for research will still require some chisel plowing, field cultivating, and roto-tilling. 2) Successful production and research outcomes with good communication and forward planning. 3) As new horticulture projects increase, we will create a rotation as we do for agronomic crops but which is close to water source and is easily accessible. 4) Organize station orientation in spring to set expectations and enable researcher teams to meet the staff.

6. Areas of concern and challenges

Supplying the labor necessary for the intensive horticultural projects becomes challenging. Our permanent staff is spread thin among the wide diversity of projects and a large number of people to assist, often at spur of the moment. Five temporary employees (i.e. summer interns) staff the gardens and assist researchers at high demand times but this funding is not part of our 101 budget and is challenging to procure. Likewise, handling the flurry of new, inexperienced student workers during the season becomes challenging in regards to traffic/parking, training on equipment, and dealing with a non-stop stream of people in and out of the office building often requesting supplies or direction.

Aging equipment/space shortage: Small-scale, intensive mixed vegetable plots call for a sundry of very specific implements; most of our line is old/worn relics from the 1930's. We currently have one small garden tractor that is fit for very small jobs such as the garden beds or laying plastic mulch. At least eight research teams need this one tractor and when the soil conditions are fit, everyone tends to need it on various implements simultaneously and bottlenecks quickly develop which delay critical planting. The composting operation continues but our current tractor and compost turner are at or beyond their useful life and need to be replaced soon. Food waste contaminates were still an issue but Grounds has recently decided to divert the material to the Middleton digester. A shed over the compost rows or even a concrete pad would lessen the environmental impact by reducing runoff and leaching and allow for anytime access which will result in more uniform, consistent end product.