



2023

ANNUAL REPORT



**AG AND
ENERGY**
CENTER

CLC CENTRAL
LAKES COLLEGE



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President's message



Greetings -

We are delighted to present the annual report for the Central Lakes College Ag and Energy Center, highlighting this year's many achievements and partnerships.

Expanded Educational Outreach: One of the year's highlights was the ACRE program, which was implemented in collaboration with the Region 5 Development Commission. We hosted 800 middle and high school students for an immersive day at CLC. This hands-on experience provided students with valuable insights into careers in agriculture, fostering a dynamic learning environment. We also participated in the Todd County Envirofest for the second consecutive year, working with over 350 6th-grade students to showcase the diversity of agricultural careers.

Agricultural Crop Production and Management (Precision Food Production) Program: This year included the much-anticipated launch of the Agricultural Crop Production and Management Program. Under the capable leadership of CLC faculty member, Nathan Wiese, we welcomed our first, enthusiastic students. Once again, applied experiences ground the program by incorporating our Ag & Energy Center as a laboratory for students to experience equipment, practices and expert staff.

Irrigation Training: Our commitment to excellence was evident in the successful hosting of the Irrigation Training event, showcasing our state-of-the-art precision irrigator, made possible through the RCPP project. This initiative provided hands-on, irrigation-specific training to various stakeholders, including Natural Resources Conservation Service and Board of Water and Soil Resources staff and others associated with irrigated agriculture. The positive feedback from attendees affirmed the impact of the day, with many stating that it was the best irrigation training they had ever experienced. We look forward to this event in 2024.

As we reflect on these and other accomplishments, we are filled with gratitude for the dedicated efforts of our faculty, staff, and partners. For over 50 years, our Ag and Energy Center has been committed to fostering excellence in education, community engagement, and hands-on learning experiences. That commitment is realized through your partnership, support, and a world-class team of professionals.

Thank you for your continued support. We look forward to another year of growth and success.

Sincerely,

Dr. Hara Charlier
President, Central Lakes College



Ag and Energy Research Center 2023

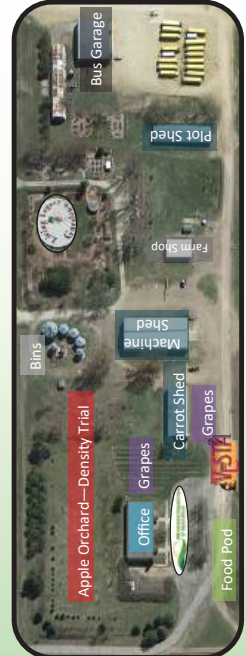
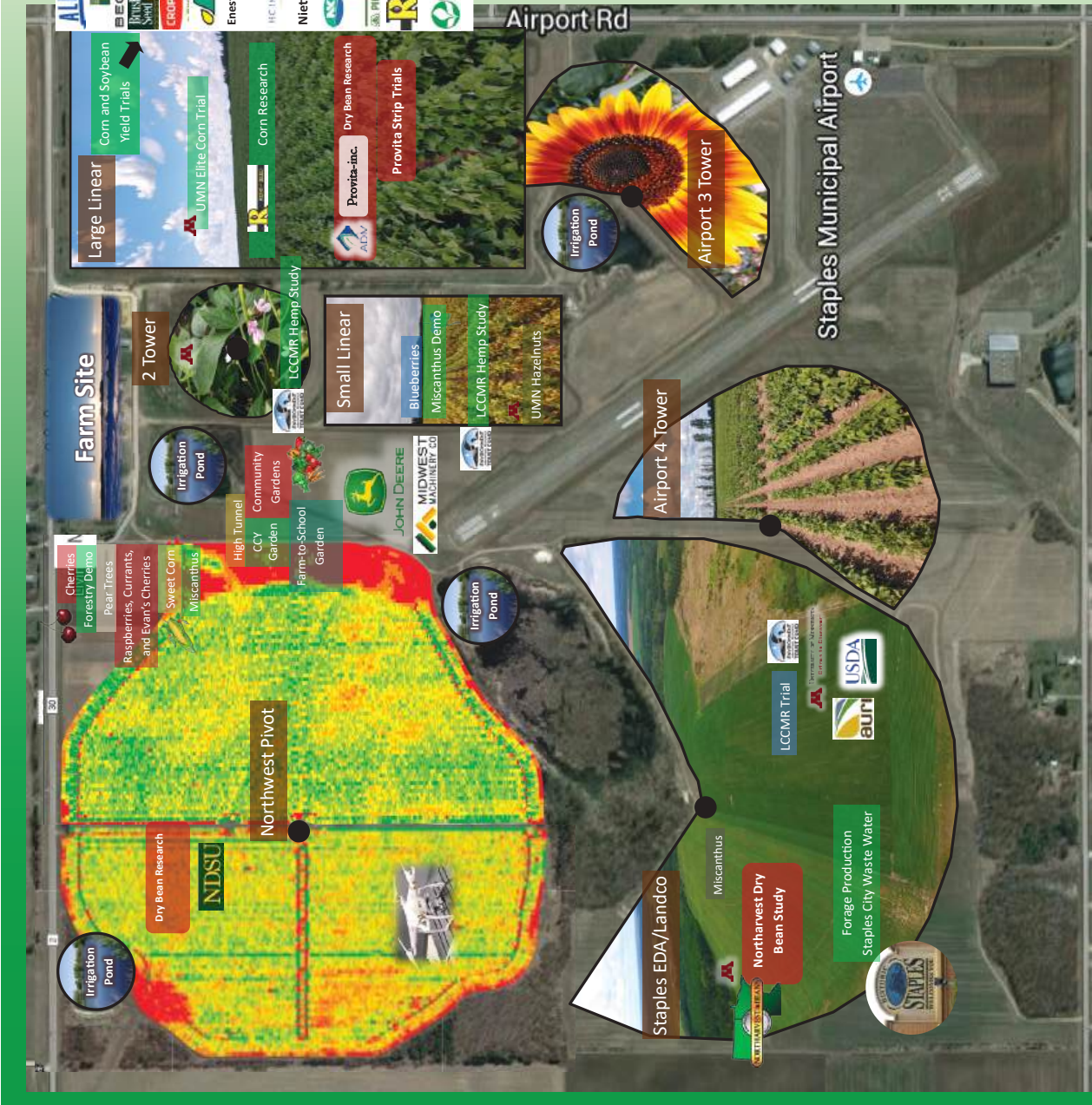
Our Mission: Central Lakes College Agricultural and Energy Center builds futures as it delivers valuable products, services, and education, which contributes to the economic vitality of the region

Center Priorities

- ◆ Precision Ag Demonstration Leader
- ◆ Irrigation Management
- ◆ Underground Water Quality
- ◆ Local Foods - Gleaning
- ◆ Catalyst for Ag Industry Research
- ◆ Explore Alternative Energy Forms
- ◆ Soil Health Demonstration
- ◆ Promote Agricultural Literacy

Contact Information

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A Letter from the Director

With the 2023 growing season behind us, the Central Lakes College Ag & energy Center would like to take time to reflect on the challenges and opportunities that came throughout the year. We wish to extend a tremendous “Thank You” to all of our partners, staff, interns, administration, and community members who make this work possible!

One of the greatest opportunities continues to be the support of our partners. The relationships with industry, state agencies, community members, federal agencies, and others create opportunities to expand research and collaboration. The Ag & Energy Center works diligently to continue to provide quality education and agricultural advocacy in Central MN and beyond. In 2023, with a growing population of the world’s people having reduced exposure to agriculture, the Ag & Energy Center and its partners have found an increased importance of getting into local schools to educate students about where our food comes from. Education will continue to be a growing priority for the Ag & Energy Center.

The Ag & Energy Center took on a new role in 2023 with the startup of our new Agricultural Crop Production and Management Program (formerly Precision Food Production). The Ag & Energy Center was, and will continue to be utilized as a hands-on lab for students learning about agronomic practices. Nathan Wiese was hired as a faculty member and will lead this program to success.

As we reflect on agricultural economics in 2023, it is clear that new and innovative ideas are needed in agriculture to increase viability. Economic viability and environmental sustainability are top of mind for most producers. We anticipate that economics for most farm operations in 2023 will look much different than they did in the past couple of years, leaving less profit to the operation. As we look to 2024, the current commodity prices indicate another very challenging year financially for farmers. The Ag & Energy Center strives to be a resource for innovative ideas to work through these challenges.

The Ag & Energy Center seeks to continue growing and developing partnerships, while providing agricultural knowledge and innovation to the public. The Ag & Energy Center continues to work closely with its partners to offer resources to legislators and provide testimony for important agricultural issues. We thank all of those who have been a part of the work that Ag & Energy completed in 2023 and look forward to new opportunities in 2024.

Sincerely,

Cory Detloff
Director of Ag & Energy/Farm Business Management





AG AND ENERGY TEAM CENTER



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Student Interns

Ellie Anderson
Chandler Braith
Caden Mrazek
Ryan Larson
Brayden Ehnert





Saying Farewell to Hannah Swarzenfruber



Hello everyone!
Last summer was the start of my thirteenth season working at the Ag and Energy Center. I had worked three summers as an intern in college and then was hired on full time after I graduated from NDSU in December 2014. As many of you know, I resigned from my position as the Research Manager at the Ag and Energy Center last summer June 2. That is the birth-day of my son named Ezekiel. I was blessed with a mom who stayed home when I was little and always dreamed about being able to do that for my own kids and raising them on the farm.



Since resigning from the Ag and Energy Center life has been full of changes. This summer I worked with my husband and our son on putting the main floor and an upstairs on our existing basement. We have slowly been working on this throughout the entire year and hope to move upstairs yet this year out of the basement. It surely beats living in a tent like our first year of marriage. In the midst of all this, I did have a large garden full of everything you can imagine like purple cauliflower, red carrots, yellow tomatoes, squash, watermelon, cantaloupe, red potatoes, and of course one of my favorites, edible beans! My

husband and I also have a small herd of beef cows that we are hoping to get into a rotational grazing system this coming year. It's fun to watch the baby calves hopping across the pasture.



I thoroughly enjoyed my position at the Ag and Energy Center working with everyone. I loved the fact that working at the Ag Center meant that I could work outside, meet new people, build relationships, mentor interns, and watch the plants grow and mature every year. I appreciated the variety of my job and that no two days were ever the same. The thing that I miss the most about my job is all the people and hearing your stories. I enjoy stories and the many things that you have taught me through the years. I hope to take these skills that I learned and pass them onto my children. Thank you everyone for taking the time to mentor me and teach me throughout my years at the Ag Center. Blessings!

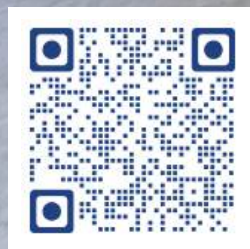


LETS GET SOCIAL!

Scan these bar codes with your phone to head over to our various social medias. Following these accounts will keep you up to date on current happenings at the Ag and Energy Center.



Ag and Energy Website



Living Legacy Garden Facebook



Ag and Energy Youtube



Ag and Energy Facebook



Sota Grown Facebook

Student Intern Biographies



Ellie Anderson

Hi there! My name is Eliana Anderson, but everyone just calls me Ellie. This is my second year at the Ag and Energy Center as an intern. I originally was not going to come back again but decided to come back again when given the opportunity. I am glad I did. I was able to do more things that I wasn't able to do last year. The main thing was leading and teaching a craft at the children's garden.

I highly recommend doing an internship at the Ag and Energy Center even if you are not going into agriculture. I am going into Social Work, but I have learned so many life lessons from the ag center that I will use in my career as a Social Worker. The people who work here are some of the kindest and most sincere people you will ever meet. They push you to grow and get out of your comfort zone.

If I could give one piece of advice to anyone thinking of becoming an intern it would be the following. You must embrace and find joy in the hard or rough days. If you just have a sucky attitude when doing gross tasks (grapes or blueberries) it will just make the day even worse. Always try to make those jobs fun, otherwise it is going to be a long summer.



Chandler Braith

Hi, my name is Chandler Braith and this is my first year working as an intern here at the CLC Ag and Energy Center. I grew up in Staples and graduated from Staples-Motley High School last year in 2022. I am currently attending The University of Minnesota-Duluth for Mechanical Engineering and will be going back for my second year this fall.

Working here as an Intern has been probably my favorite job so far. I don't have much agricultural or farming background, so I had much to learn, but all the staff and workers here were super kind, patient, and willing to help me learn. We've done lots of things here on the farm as interns like weeding in the gardens, planting in the pod, flying drones, taking water samples, and helping out in the fields. My favorite job this summer has been helping out with planting the variety trials. It was really cool to see how the planter worked as well as the controls and GPS inside the tractor too. I learned so much and I would very much recommend this internship to anybody whether you have knowledge in agriculture or not. It is a great summer job to explore any interest you may have in this field and there are lots of opportunities in agriculture.



Student Intern Biographies



Caden Mrazek

SMHS graduate. I enjoy spending time in the gym and with friends, and working at the farm I was lucky to be able to combine both of those interests. In high school I was a part of FFA and in my younger years I spent a lot of time in 4-H, but most of my experience was in the livestock side of agriculture. I had a blast working at the farm this summer! Learning all the ins and outs of the farm taught me a ton and I'm super grateful for the opportunity. I'm attending CLC in Brainerd for welding in the 23-24 school year and hope to accumulate all the information I've learned over my high school career and this summer at the farm into my career. I would like to thank Noah, the farm crew, and my fellow interns for making my experience at the farm very pleasant, and I would encourage anyone pursuing a career in agriculture or any other technical career to apply!



Brayden Ehner

This Summer I was lucky enough to help Todd, Taylor, and Bruce with whatever was needed. This typically included helping with irrigation issues, running the water and chemical truck, helping maintain machinery, and helping with events on the farm to name a few. I really enjoyed my time and would recommend it to anyone who loves to be outdoors all day.



Mission Statement

Central Lakes College Ag and Energy Center builds futures as it delivers valuable products, services, and education which contributes to the economic vitality of the region.

CLC AG AND ENERGY CENTER Acreage and Yield Report

Crop	Acres	Yield/Acre	Total Production
Irrigated Corn	751	201 bu/A	150,951 bu
Irrigated Soybeans	329	47 bu/A	15,463 bu
Irrigated DRK Beans	525	2,116 lbs/A	1,110,900 lbs
Irrigated Barley	55	77 bu/A	4,235 bu
Dryland Corn	150	73 bu/A	10,950 bu
Dryland Soybeans	45	10 bu/A	450 bu
Irrigated Black beans	150	652 lbs/A	97,800 lbs

Collaborations

AgCentric

Farm Business Management

Lakewood Health Systems

Midwest Machinery Company

Minnesota Department of Agriculture

Natural Resources Conservation Services

Northwest AquaTek Solutions

R.D. Offutt Company

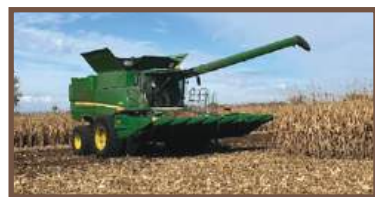
Renk Seed Company

Sustainable Farming Association

Todd-Wadena Electric Company



2023 Research Summary



Research Partnership	Acreage	Priorities
ADM	0.25	Ag Industry Research
		Water Quality
		Ag Industry Research
Byron Site	651	Precision Ag Demo
		Soil Health
		Ag Literacy
		Ag Industry Research
Corn & Soybean Demo	12.5	Ag Literacy
		Soil Health
		Ag Literacy
LCCMR Cover Crop Study	40	Water Quality
		Soil Health
		Ag Literacy
LCCMR Hemp Study	4	Ag Industry Research
		Water Quality
NDSU	0.5	Ag Industry Research
Northarvest Grant with U of M	30	Ag Industry Research
Provita Inc.	10	Ag Industry Research
RCPP Grant	100	Ag Industry Research
		Irrigation
Renk Seed Company	5	Precision Ag Demo
		Ag Industry Research
		Soil Health
UMN Elite Corn Trial	4	Ag Literacy
		Ag Industry Research
		Ag Industry Research
UMN Hazlenuts	1	Local Foods
		Local Foods
FBM High Tunnel Project	.45	Ag Industry Research
		Local Foods
		Ag Literacy

*Note: Acreage not accounted for under research is used for rotation, border, and filler

2023 Research & Demonstration Overview

- ADM
- Agricultural Utilization Research Institute
- Allegiant Seed
- BASF
- Beck Seeds
- CHS Prairie Lakes
- Croplan Seed
- Dahlman Seed
- Enestvedt Seed
- Dekalb
- Leaf River Ag Services
- Minnesota Department of Agriculture
- North Dakota State University
- Northwest Aqwatek Solutions (NWATs)
- R. D. Offutt Company
- Renk Seed
- Pioneer Seed
- ProVita, Inc.
- Stine Seeds
- University of Minnesota, Twin Cities, MN
- US Department of Agriculture, Morris, MN
- Wadena and Ottertail SWCD

**The Ag and Energy Center serves as a catalyst for research, therefore, data that is collected is reported to our research partners. If you have specific questions concerning research projects or results at the Ag Center, please contact Noah Boelter - Noah.Boelter@clcmn.edu, or Todd Pollema todd.pollema@clcmn.edu

ADM and Provita Variety Block

ADM and Provita had edible bean variety test plots located in the Large Linear Field in the Northeast area. The plot totaled approximately three acres. ADM had 48 four row plots. Provita had a total of 430 two row plots with guard rows on either side of the experimental lines to prevent unequal competition. Herbicide damage early on in the season negatively impacted yield results for the 2023 growing season. Planting, weed control, data collection, and harvest was enjoyable. Samples were collected, cleaned, and processed for reporting purposes. Data collected includes moisture, weight, yield, and a 100 bean count.



Corn and Soybean Brand Demonstration

Historically, this plot has been at the school farm since its beginning in 1968. This year we worked with 11 different companies with a total of 81 different four row plots. This is a demonstrative plot as the varieties are not replicated throughout the plot. The results are used to compare variety characteristics and yields on the sandy soils of Central MN by seed dealers, producers, and community members.

Byron Site



This project is located in the Byron Township. The goal of this project is to increase the soil health and biology through nitrogen management, irrigation scheduling, cover crops, and crop rotation. Several new precision agricultural practices have been implemented to help execute this project such as monitoring wells, the latest irrigation technology, and yield monitoring. With the primary concern being soil erosion due to the sandy composition of the soil, grazing management has been implemented in conjunction with a SARE grant.

LCCMR Crop System Study

This project received a one year-extension due to the nature of the droughts experienced in previous growing seasons. Data was collected only on the on-farm location at the Ag and Energy Center. This years crop in the corn soybean rotation was corn. Overall, the perennial cover cropping system was the most successful in mitigating nitrate leaching, however these plots also had a 20 percent yield loss due to competition between the cover crop and the traditional crop. Final re-orting for this project will take place in 2024.



LCCMR Hemp Study

2023 was the second year of the LCCMR hemp project. For this project, the goal is to evaluate how hemp crops may reduce nitrogen contamination of surface and groundwater in conventional crop

rotations while demonstrating the environmental and economic benefits of hemp production. Collaborators for this project include the University of Minnesota and AURI. There are three different farm locations for this project, Lamberton, Morris, and Staples - all located in Minnesota. Lysimeters were installed in 2023 to monitor nitrate concentrations in the ground water. Do to unforeseen circumstances, The lysimeters were unable to collect samples.



NDSU Dry Bean Research

This was the third year we were awarded a grant by the Northarvest Bean Grower's Association to work with Juan Osorno, a NDSU edible bean breeder, to establish three kidney preliminary variety trials (KPYT). The KPYT trial consisted of dark red (38), light red (28), and white kidney (20) breeding lines from the NDSU dry bean breeding program at the final stages of testing and selection. Challenges that faced this trial was herbicide damage early in the growing season which caused a yield reduction.



Northharvest Grant in Partnership with U of M

This was the Second year we were awarded a grant by the Northharvest Bean Grower's Association to work with Dan Kaiser to establish edible bean plots to study nitrogen rates across black, navy, and kidney beans. In conjunction with these small plots, a large field scale study was established on the Qualls field. The goal of the large scale field study was to determine the affect of reduced nitrogen rates on yield. The control top dress application was 60 units of nitrogen. Then two application rates were tested including 40 units and 20 units of nitrogen. Total amount of nitrogen across the three different treatments were control at 116 units and then reduced to 96 units and 76 units of nitrogen. Results are included in the research reports pages.



RCPG Grant

Through funding from the Regional Conservation Partnership Program, we installed a precision pivot at the Ag and Energy Center. This irrigator was installed in the NW Pivot field. With last years well drilling troubles in the past, we were able to get the irrigator up and running in July. We were able to host an irrigation clinic in July to showcase this piece of technology. In 2024 we look forward to getting more in depth with utilizing prescription irrigation on the Northwest Pivot.



Provita Large Strip Trial

Provita continued their mini strip demonstration trial for a fourth year. The strips were eight rows wide by 500 feet long. There was a total of 27 different dark and light red kidney bean varieties in this trial. The goal of this study was to examine how these varieties performed under general field conditions similar

to what a farmer would execute on his or her own operation in preparation to release these varieties to edible bean producers.

See pages

Renk Seed Company

Renk Seed planted and harvested a research trial that evaluates new elite corn hybrids in a two acre replicated plot to assess hybrid characteristics and yield.

UMN Elite Corn Trial

The UMN Agronomy and Soil Science Department plants and harvests an elite replicated corn trial throughout the state of Minnesota every year with a long-standing history to test new corn varieties. More information can be found at this link: <https://varietytrials.umn.edu/corn-grain>

UMN Hazelnuts

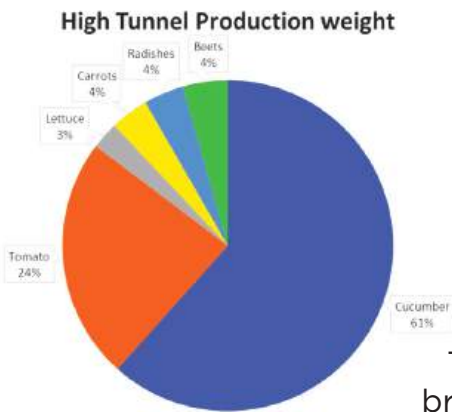
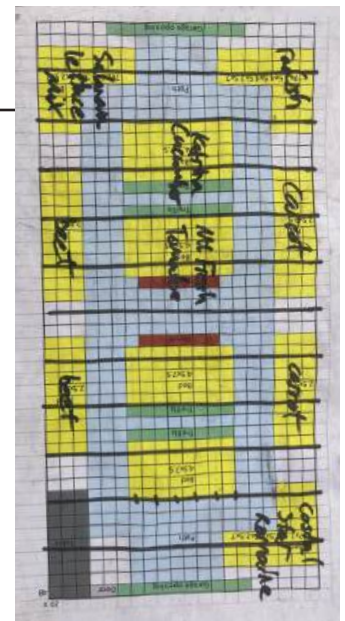
Lois Braun, University of Minnesota hazelnut researcher, established hazelnuts at the Ag Center in 2000. This project is currently focusing on nitrogen management in different genetic cultivars of hazelnuts. This year strides were once again made to propagate different hazelnut cultivars through mound layering.



Hazelnuts

High Tunnel Renovation

Before and after of our high tunnel renovation. Farm Business Management instructor Erik Heimark, received a grant this year to update the high tunnel for his course, "Farm Business Basics."



The Ag and Energy Center maintained the high tunnel and Erik brought in his students for field trips. The produce from the high tunnel was donated locally once harvested.

High Tunnel Production

type of produce	weight
Cucumber	553.99
Tomato	212.74
Lettuce	24.03
Carrots	33.54
Radishes	35.34
Beets	39.43
Total produce:	899.07

Expense Data Conclusions

- Revenue from 1 year of sales will not cover start up costs even without labor and raised beds
- NRCS EQIP funding would significantly contribute to the start-up costs
- Many farmers already have plant starting and harvest equipment
- Packaging was the greatest contributor to annual expenses
- Supply and Chemical costs could be lowered with more permanent infrastructure

Manure Analysis Program

This was the fifth year the CLC Ag and Energy Center continued in a principle role in the Manure Analysis Proficiency Program. Previously, it was completely administered by the Minnesota Department of Ag through Jerry Floren and housed at the CLC Ag Center. This year Todd Pollema was solely in charge of collecting, bottling, and shipping manure samples. The MAP Program mixes six different homogeneous samples that are replicated three times and two sample sets are shipped out throughout the year. Once each sample is prepared and bottled, then these are packaged and shipped to labs across the nation and even internationally into Canada. There is approximately 60 different labs that receive



these samples. The labs process the samples and send their results back to personnel at the CLC Ag Center. The results are analyzed with statistical software that evaluate

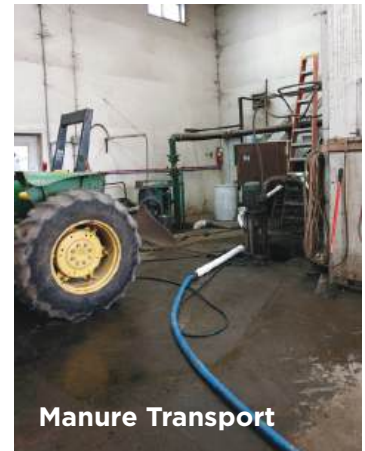
labs for precision and accuracy. The results are then sent to the MDA, which certify the best performing labs for manure testing. This certification makes it easier for clients to find qualified laboratories and gives them more confidence in the lab results they receive.



Manure Generator



Manure Storage



Manure Transport



Collecting Manure



Mixer & Bottling



Replicate Sample

NRCS Training Days

This was the third year that we partnered with NRCS (Natural Resource Conservation Services) to train approximately 25 field agents in an agronomy 101 course. These individuals came to the farm three times throughout the season. The first session was a spring session that involved crop planning, tillage equipment overviews, and a farm economic presentation. The second session occurred midway through the summer at the Haubenschild Farm Inc., located in Princeton Minnesota. This event included a farm tour. Topics at this session included forage production, how the methane digester worked, and how NRCS funded projects have been utilized at this farm. The fall session was back at the farm including topics such as combining, high speed tillage in the fall, 60" corn with cover crops incorporated into it, as well as the technology trailer.

Through the partnership with NRCS, internships have been also offered to natural resource. Another goal of this partnership is to learn more about conservation practices, particularly soil health, through cover crops and grazing. Work continues to be completed up on the Byron fields with establishing cover crops and grazing them with cows in the spring or fall depending upon when the forage is there.



C2A3 Conference

The Community College Alliance for Agriculture Advancement (C2A3) is a collaboration of ten Midwest community colleges across nine states who have joined together to provide quality education, training and demonstrations to future farm producers and agriculture service providers. Members of the Alliance partner to share resources, faculty expertise, curriculum and tools to advance agriculture in their regions.

Midwest community colleges with strong agricultural programs and traditions have joined together in a national consortium to sign a memorandum of understanding with the United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS).

This collaboration, which also includes USDA's Natural Resource Conservation Service (NRCS) and the Sustainable Agriculture Research and Education Program (SARE), was born out of a mutual desire to provide more ongoing education, training and demonstration to future farm producers and agricultural service providers with the goal of improving the health, and therefore the long-term productivity, resilience, and sustainability of the soil. The 2023 annual conference was held at Illinois Central College in East Peoria, Illinois.

LOCATIONS



- | | | |
|---|---|---|
| 1. Central Lakes College
Staples, MN
clcmn.edu | 5. North Dakota State
College of Science
Wahpeton, ND
nbsc.edu | 8. Northeast Community
College*
Norfolk, NE
northeast.edu |
| 2. Clark State College
Springfield, OH
clarkstate.edu | 6. Lake Area Technical
College^
Watertown, SD
lakeareatech.edu | 9. Northeast Iowa Community
College*
Calmar, IA
nicc.edu |
| 3. Illinois Central College*
East Peoria, IL
icc.edu | 7. Northcentral Technical
College*
Wausau, WI
ntc.edu | 10. Richland Community
College*
Decatur, IL
richland.edu |
| 4. Ivy Tech Community
College - Lafayette
Lafayette, IN
ivytech.edu | | |

Producer Groups

EDUCATIONAL ADVISORY

CMI

The Ag and Energy Center director serves as an educational advisor to CMI (Central Minnesota Irrigators). We partner together with CMI to put on workshops and seminars for area farmers and irrigators of Central Minnesota. We participate in quarterly board meetings and provide website support and information on grazing integration. This year we are providing support for the annual meeting again. The annual meeting brings together local irrigators and farmers to inform them about legislation and regulations concerning irrigation as well as other topics. We also partner with CMI to promote scholarships for Ag teachers of Minnesota for water quality education in the classrooms. For more information please check out their website: <http://centralmnirrigators.org>



Crow Wing River Basin Forage Council

Another advisory role that we participate in concerns the Crow Wing River Forage Council. We meet with this group quarterly at their board meetings to discuss issues relating to cattle, forage, and grazing throughout the region. We partner with this group to put on events including their annual winter meeting and summer tours throughout the region for area ranches. The Ag Center also has worked with area producers to integrate cattle into field operations on the farm. For more information please check out this link: <https://www.sfa-mn.org/forage-council/>



Future 2024 and Beyond

As we celebrate another harvest season come and gone, we continue to look forward to all the new exciting opportunities in the coming year!

BWSR collaboration

Central Lakes College's Ag & Energy Center is teaming up with the Board of Water and Soil Resources (BWSR) to enhance hands-on training opportunities for Soil and Water Conservation District (SWCD) staff. The program, "Cultivating Career Success: On Farm Communications Training," is set to broaden its scope, offering immersive experiences throughout the spring, summer, and fall seasons on a working research farm. These immersive training days are carefully crafted to equip participants with hands-on technical knowledge and educational insights covering various aspects of modern agriculture. The diverse curriculum includes sessions on Equipment Ride and Drives, Irrigation, Farm Economics, Livestock Management, Cover Crops, Conservation Practices, Crop Rotation & Planning, Fertility & Integrated Pest Management, as well as Technology and Precision Agriculture.



Ag Program starts second year

Agricultural Crop Production & Management (formerly named Precision Food Production) kicked off its first year of classes in the fall of 2023 at the Central Lakes College Staples Campus. Students were able to utilize the Ag & Energy Center to further their education with hands on field experience. In field activities such as identify weeds, soil sampling, and variety trial comparisons complimented courses such as Weed Id, Soil Science, and Intro to Agronomy. Partnerships with Ag & Energy, AgCentric, private companies, and state agencies provides a unique opportunity for students to learn about agriculture, through multiple different lenses, while attending classes at the Staples Campus.

Meat Cutting Program

Staples Campus has an exciting new program in Meat Cutting & Butchery that started last fall. This program is the result of a few years of work with industry partners, legislative leaders and the

agriculture community. A workforce that was short of available trained butchers and a backlog in processing especially for small and medium-sized producers created a push for training programs that could help with both of those issues.



CLC created a program that gave students experience from harvest to final packaging. Jess Feierabend was hired as the faculty member for the program and brought extensive experience in both the retail and ag side of the business. His expertise and the support of partners like Cub Foods in Baxter and the Henning Meat Market gave our students hands-on experiences in a variety of settings.

Funding from our state and federal legislators has made this all possible and will support this program for the next few years as it gets established. A grant that the college, along with other invested partners, from the U.S. Economic Development Administration (EDA) will purchase state-of-the-art processing and training modules that will be placed on the Staples Campus this April. This will give our students the best training facility available right on campus.





'Sota Grown

Local produce that's always fresh & always growing



GOAL

The overall goal of the CLC operated Sota Grown food container is to better understand the energy, water, sustainability and community impact of indoor agriculture.

Growing Environment

Production begins at the nursery station. Seeds are planted into peat moss plugs and placed into trays. Once the planting is completed the trays are put into the seedling troughs, where they stay for three weeks. During this time, water floods the trough periodically, giving the seeds the water and nutrients needed to thrive. Germination takes around five to seven days, depending on what is grown. At three weeks, seedlings are old enough to be transplanted into the growing panels, where they hang vertically. Water is pumped from the main tank to the pipes above the panels. Emitters drip water onto the felt strips in the panels, effectively saturating the plant's roots. The plants receive all of their "sunlight" from LEDs. 120 LED boards are purposefully designed to emit

only select wavelengths of red and blue light, which plants are able to absorb best for photosynthesis. Each color has a special purpose: blue light stimulates stem growth, while red light helps the plant grow dense and healthy leaves. The red LEDs also provide the only heating for the container, even in the winter time. Once the plants have spent eight weeks in the vertical growing panels they are ready to be harvested. The panels are taken down and harvest is done on the food-safe table in the container. The produce is harvested, weighed, bagged, and sent to Lakewood Health System, where they distribute it to employees, Hilltop Regional Kitchen, and their "Food Farmacy" program. After harvest the panels are cleaned and the life-cycle repeats.





GROWING PAINS

- Electrical Issues
- Energy Inefficiency
- Flooding
- Climate
- Algae
- Drought



Looking Forward

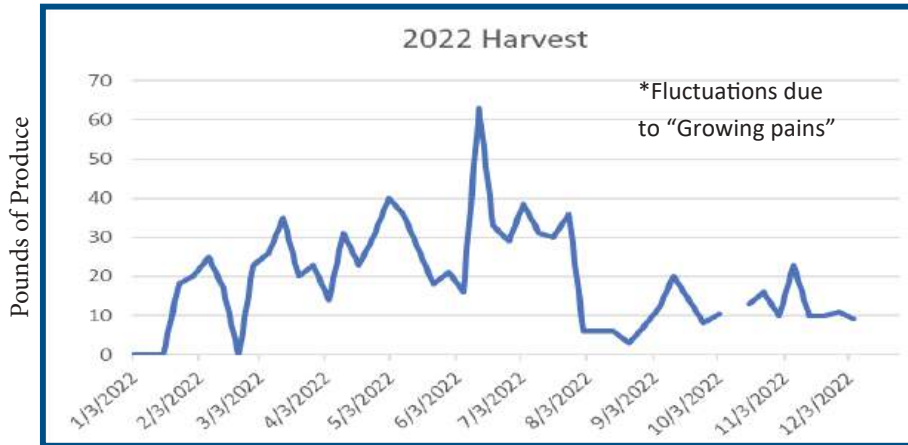
Our goal for 2024 is to continue to do the best we can with maintaining the Sota Grown Container. Over our time with the container, we have found kale to be the most vigorous.

BENEFITS

- Nutrient Dense Produce
- Controlled Environment
- Sustainability
- Water Savings
- Year Round Harvest
- Easier Accessibility
- Educational Opportunity
- Reduced / no pesticide use

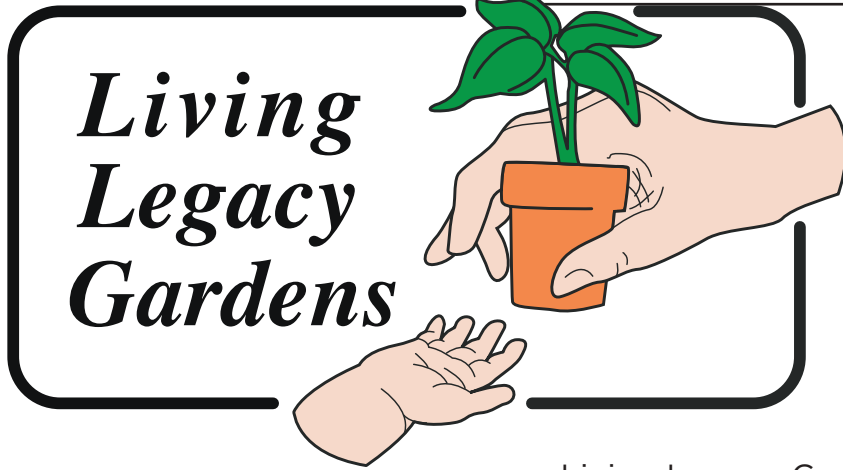


COLLABORATORS



Contact Noah.Boelter@clcmn.edu or Tammy.Rick@clcmn.edu for more information. You can also follow along on Facebook!

Living Legacy Gardens



Living Legacy Garden is a public garden located at CLC's Ag & Energy Center in Staples, MN. The garden was started in 2000 with the purpose of providing a site for demonstration and education to the home gardener in regard to plants that grow well in our Zone 3 & 4 climate.

There were several highlights for

Living Legacy Gardens in 2023. In May, a beautiful new fountain was added to the courtyard area in memory of Jim Kurpius, whose family farm was located on the garden site in the 1940's & 50's. The fountain was purchased with donations from his family.

In July, the garden staff, interns and volunteers enjoyed a field trip to an inspiring garden and floral shop in Milaca.



Living Legacy Gardens



In August, we celebrated the annual Ag & Energy Center's Field Day. Our typical garden ice cream social was made even more special with an ice cream cart and live music from a local string group, Skal Klubben. This event was sponsored by the CLC Foundation.

Living Legacy Gardens offered two well-attended classes to the community this year: a Worm Bin/Vermiculture Class in May and a Wreath Making Class in November. The gardens saw visitor numbers holding steady at 3,305 and there were 14 donated memorial paver's installed.

Living Legacy Gardens would not be possible without the dedicated work of our faithful volunteers and we are always looking for new folks to join us!



Anne Converse
Dan Ackermann
LaVonne Selleck
Duane Strack
Lois Kneisel
Mary Sperley
Shirley Arnold

Local Foods



LOCAL FOODS SYSTEMS VITALITY

Economics and Sustainability

The Ag center is involved with the promotion of local foods throughout our community through community gardens, youth gardens, children's gardens, the 'Sota Grown pod, and a high tunnel demonstration. The Living Legacy Garden also includes an apple orchard that demonstrates multiple varieties. 2023 proved to be a good producing year for local apple producers. The apples were also sold to community members, and funds are used for orchard maintenance. The Ag and Energy Center also has a blueberry patch that community members can enjoy through a u-pick during the warm summer months of July and August. Funds earned are used to improve the blueberry patch by planting new bushes and spreading wood chips to decrease weed pressure.

This year was the fourth year we collaborated with the Staples-Motley school district to initiate a farm-to-school garden. Melissa Jewison was instrumental in organizing, planting, weeding, and harvesting the garden fruits and veggies along with a few students and friends. The goal over the next few years is to continue to grow this project and involve more students in the process.

Ag and Energy Center Gleaned Produce

Specialty Crops

- Apples
- Blueberries
- Cherries
- Grapes
- Herbs
- Raspberries
- Potatoes
- Sweet Corn

The Center also has a Specialty Crop Block, which includes raspberries, cherries, currants, elderberries, and juneberries. The goal of this block is to demonstrate cold hardy fruits that do well in this region. Produce from these crops is available as a u-pick and for more information, please contact Tammy Rick at tammy.rick@clcmn.edu.

Viticulture

The Center also has three vineyard demonstration plots. Table grape varieties are demonstrated in a system where the vines are laid down each fall to be protected from the harsh winter months. A grape variety block is demonstrated on a high wire trellis system. The last plot is testing how different varieties typically grown for wine grow on different trellis systems.

One trellis system is the high wire system. The other is the vertical shoot positioning system. Yield is the primary factor that is being calculated in determining which system is more suitable to the region. This year the grapes produced 328 pounds that was utilized by community members.



2023 Gleaning Program Report

Central Lakes College, Ag and Energy, Staples, MN

Consumers	Growing Location	Produce	Amount (lbs)
Community Corrections Youth Garden			
	Community Gardens	garden produce	1,400
Community Members			
	Orchard	apples	2,026
	Blueberry Patch	blueberries	40
	Vineyard	grapes	328
	High Tunnel	cucumbers	554
	High Tunnel	tomatoes	213
	U-pick Sweet Corn	sweet corn	3,691
Lakewood Health System			
	Sota Grown Hydroponic	kale, lettuce	348
Staples Area Foodshelf			
	U-pick Sweet Corn	sweet corn	200
Staples Lions			
	U-pick Sweet Corn	sweet corn	500
TOTAL AMOUNT OF FOOD GLEANED, UTILIZED, & DONATED			9,300



Living Legacy

- CHILDREN'S GARDEN -



The Children's garden is a bi-weekly program that includes a take-home craft, gardening education, and gardening. This educational outreach program is increasingly important because these kids are the next generation of farmers, educators, politicians, etc. Nourishing a strong foundation in gardening encourages kids to eat healthier, spend more time outside, provides engaging exercise, and teaches responsibility. All of these things can benefit them for years to come. We look forward to once again putting on the Living Legacies' Children's gardening program in 2023. For more information, Contact Noah.Boelter@clcmn.edu.



Drones and Dragonflies!

Taylor gave a presentation about what drones are used for in Ag, followed by a dragonfly craft!

Bird Seed Shapes!

What a fun way to get creative and to feed the birds. The kids enjoyed crafting all sorts of shapes for their resident birds at home to enjoy!



Honeybees!

Elizabeth Warren brought in an observation bee hive for the students to learn about the importance of pollination. We made beeswax candles to follow!



Fairy Gardens!

This craft was loaded with creativity. Each kid selected a baggie of goodies and two succulents to plant in their fairy gardens. This class is always a big hit!



Flower Pot Painting!

Painting flower pots is such a blast! After painting, we sent the students home with a plant for their beautiful pots!

Harvest!

Such a fun day! Everyone went home with arms full of produce they had grown over the summer



CENTRAL LAKES COLLEGE
AG AND ENERGY RESEARCH CENTER

FIELD DAY



FRIDAY, AUGUST 25, 2023

26505 COUNTY ROAD 2 | STAPLES, MN

NO PRE-REGISTRATION REQUIRED

9AM-12PM EVENTS

Drone Flights

Pod/High Tunnel Tours

Vendors inside the shed

Tractor Ride N' Drive

MORNING TOURS

Session 1 (Pick one)

10am-10:45am

Conserving Water

Through Precision Irrigation

Jeppie Kjaersgaard- MDA

10am-10:45am

Fertilizer Rate Comparisons

for Edible Beans

Dan Kaiser - UMN Ext.

10am-11:45am

Local Foods Tour of the various horticultural crops that we have growing at the farm

Eric Heimark CLC FBM,
CLC Ag Center

Session 2 (Pick one)

11am-11:45am

Hemp For Water Quality

Tom Michaels - U of M

11am-11:45am

Children's Garden Program and Explore the AgCentric Trailer

Judy Barka

11am-11:45am

Farm Programs and Initiatives from NRCS Staff

AFTERNOON EVENTS

12-1:30pm

Lunch Program

Pulled Pork Sandwiches, Sweet Corn, Potato Salad, Coleslaw, Cowboy Beans, Water

1pm-3pm

Ice Cream Social

Living Legacy Gardens Tours

Skal Klubben Performance

(Scandinavian named violin group)



CLC CENTRAL LAKES COLLEGE

www.clcmn.edu/ag-energy-center/

FOR MORE INFORMATION CONTACT:

Melody Weber - 218.894.5123 | Tyler Grunewald - 218.894.5141



Educational Outreach

One of the priorities of the CLC Ag and Energy Center is to promote agricultural literacy. One of the ways we strive to achieve this is through reaching out to the community and the surrounding area through events.

Groups that we inter-act with include Staples-Motley students (K-12), CLC horticulture students, student inters, industry professionals, farmers, community members, and legislators.

YouTube Channel

A YouTube channel was created to showcase what happens at the Ag Center on a day-to-day basis. Check out our videos by scanning this bar code.



Website

The Ag and Energy Center website contains farm history, research projects, events, contact info and much more.



NRCS Irrigation Workshop

See Page 32-33

Children's Garden Program

See pg. 28

Facebook

With a goal of reaching a larger audience, An Ag Center Facebook page was created. Videos, agriculture information, and upcoming events are some of the things you will find there.



Wreath Making Class

Living Legacy Gardens Once again hosted its annual wreath making class in the fall. Tammy Rick and Becky Roelof showed community members how to create their own one-of-a-kind wreaths.

Annual Field Day

This event showcased the various research projects and connected community members, legislators, researchers, and area farmers. There were 200+ participants in 2023. There was activities for all ages throughout the day including a ride and drive, kids gardening, drone flights, and an ice cream social in the Living Legacy Gardens.

ACRE Days

See pg. 34

Senator Putnam Visit

Senator Aric Putnam visited the Ag and Energy Center in August to see Central Lakes Colleges Meat cutting program. Local farmers were invited to a round table discussion to discuss farm is-sues. A ride-and-drive was also part of the days activities.

Living Legacy Worm Bin Class

The Living Legacy garden host-ed a worm bin class. Elizabeth Warren, a local worm farmer, came in to show participants how to raise worms and what they and their casting can be used for. There were 13 participants that attended the class.



Educational Outreach



NRCS field days

Irrigation workshop introduces NRCS, SWCD staff to latest tech



Details

TTCP: The [Technical Training and Certification Program](#) is funded by a contribution agreement between BWSR (Clean Water Funds) and NRCS (Farm Bill dollars).

Project area: Involves SWCDs from Becker, Benton, Cass, Dakota, Douglas, East Otter Tail, Grant, Hubbard, Kandiyohi, Meeker, Morrison, Pope, Sherburne, Stearns, Stevens, Swift, Todd, Wadena, Washington and West Otter Tail counties

STAPLES — An irrigation workshop at Central Lakes College (CLC) this summer introduced Natural Resources Conservation Service (NRCS) and soil and water conservation district staff to an array of new technology, components of different irrigation systems — and some of the management decisions producers consider before making changes.

The two-day training prepared NRCS and SWCD technicians to plan, design and install practices supported by a \$3.5 million Regional Conservation Partnership Program (RCPP) grant focused on conservation work on irrigated lands within 20 central Minnesota counties. NRCS awarded the [five-year grant](#) to the Minnesota Department of Agriculture (MDA) in 2021.

Partners include 20 SWCDs, the Mille Lacs Band of Ojibwe, Central Lakes College, the University of Minnesota,



Natural Resources
Conservation
Service website:
www.nrcs.usda.gov

[AgCenter](#), plus industry representatives.

The RCPP goal: decrease water use, and improve groundwater and surface water by reducing sediment, nutrients and chemical contaminants.

The RCPP grant also supported the July 17-18 training, coordinated through the Minnesota Board of Water and Soil Resources' Technical Training and Certification Program (TTCP).

“The purpose of this workshop is really to help provide some advanced information about irrigation, irrigation technology and irrigation water management to help those staff to provide good technical assistance to irrigators,” said Jeppe Kjaersgaard, an MDA research scientist on



Left: Cory Detloff, Central Lakes College's Ag & Energy Center and Farm Business Management director, behind the table at left; and Keith Olander, executive director of AgCenter and Agricultural Partnerships with Minnesota State and CLC; led a discussion July 18 during the Irrigation RCPP Technical Training Workshop for NRCS and SWCD staff at Central Lakes College in Staples.

Center: Kelan Buchta of Grand Irrigation in Clear Lake discussed elements of irrigation.

Right: Jeff Lorentz of the Minnesota Department of Agriculture discussed chemigation.

Photo Credits: Ann Wessel, BWSR

NRCS field days



Top: A chemigation presentation led by Minnesota Department of Agriculture staff held the attention of irrigation workshop attendees, from left, Melanie Dickman, Ryan Haspel and Rick Gronseth of NRCS; Clean Water Corps member Lilly Bowman; Logan Berg of NRCS; Megan Tritz of the Benton County SWCD; and Thomas Zimmermann and Lawrence Mettler of NRCS. **Bottom:** Nathan Weise of East Otter Tail SWCD led a presentation about uniformity testing.

hand for the July 18 field tour at the college's Ag & Energy Center.

About 40 technicians attended. Willmar-based NRCS civil engineer technician Rick Gronseth was among them.

"(I'm) just using this training to have a better working knowledge of the type of systems that are in place out there, and how the industry is constantly changing and innovatively moving forward — and how we as an agency can help farmers with irrigation systems that are old and failing, and putting a good plan together with them to make sure that it's going to work for them and it's good for the environment as well," Gronseth said.

At five stations in and around the center's corn and soybean fields, industry representatives, CLC faculty and MDA staff members led discussions and demonstrations focused on wells, irrigation panels and controls, sprinklers and end guns, pivot hardware, and chemigation (applying pesticides via irrigation).

Later, East Otter Tail SWCD



staff demonstrated a method for testing the uniformity of water application by a pivot irrigation system. University of Minnesota staff members and company representatives discussed soil moisture sensors. A panel of farmers talked about the type of assistance they want from technical staff.

"We're just hoping that they understand some of the challenges that farmers face when they're looking at irrigation, and some of those decisions that they have to make on a regular annual basis (related to) irrigation. Some of those costs. Some of that technology they're making decisions upon, and then some of those day-to-day decisions on whether to irrigate or not to irrigate," said

Cory Detloff, director of CLC's Ag & Energy Center and its Farm Business Management Program.

Kjaersgaard said the 75% cost-share, which is available to producers through the RCPP, addressed the initial expense and the risk of trying something new.

"We have some irrigators that are on the front end and adopting new technology readily, and we have others that are just waiting and seeing how the different types of technologies pan out," Kjaersgaard said. "We are able to accommodate all irrigators depending how risk-averse they are. If there's an irrigator that wants to dip their toe into new technology — for example, installing soil

VIDEO: "Irrigation Workshop" features the July 18 field tour at Central Lakes College in Staples.

moisture sensors to help with irrigation scheduling — we can help provide cost-share for those soil moisture sensors. At the other end of the range, we might have some irrigators that have been utilizing some of this technology for years, and are looking more to go the final step into very advanced technology or very advanced irrigation water management. Our program can help with providing cost-share for that also."

Those newer technologies can manage nutrients and water better. Kjaersgaard explained how natural resources benefit:

"They (irrigators) can more accurately apply just the right amount of water or just the right amount of nutrients. That means there's a lower risk for over-applying water or under-applying water," Kjaersgaard said. "Because of that, we will be pumping less water from the ground. Also, there's less risk of applying too much water, which can lead to leaching of nutrients, especially nitrate nitrogen."

www.bwsr.state.mn.us

ACRE DAYS

The A.C.R.E. (AgriCulture Rural Exploration/ Education) Project held on September 21 and 22, 2023, in Staples, Minnesota, brought together over 800 junior high students from 16 school districts in Cass, Crow Wing, Morrison, Todd, and Wadena counties. This educational initiative provided students with a unique opportunity to explore agriculture and rural life in their region.

The students participated in on-farm field trips within their respective counties, as well as visits to the Central Lakes College Ag & Energy Research Center. These field trips offered a hands-on learning

experience, allowing students to connect with the agricultural and rural aspects of their community.

The scheduling of the field trips is noteworthy, with the morning sessions taking place at either the students' local farm sites or the Ag & Energy Center, followed by afternoon trips to the other location. This approach ensured that the students had a well-rounded exposure to the agricultural and energy-related aspects of their region, promoting education and awareness about rural life and its significance.



Topics covered:

- **Meat Cutting Demonstration:** Students had the opportunity to witness a meat cutting demonstration, gaining insights into the butchery and processing aspect of the food industry.
- **Rainfall Simulator:** A rainfall simulator likely demonstrated the impact of rainfall on soil and how it can affect agriculture and water management.
- **Drone Flight:** Students got to fly a drone, introducing them to the use of modern technology in agriculture, such as precision agriculture and crop monitoring.

- **Soil Tunnel:** The soil tunnel allowed students to walk through and learn about soil science and its importance in agriculture and land management.
- **Transportation Simulators:** Interaction with transportation simulators provided insight into the transportation and logistics aspects of agriculture.
- **Plant Science and Crop Scouting:** This likely involved learning about plant science, crop management, and the practices involved in effective crop scouting.



Byron Township Project

PROJECT MISSION

Design and execute a land management plan that fosters soil health and provides adaptive management options that can be replicated to ultimately balance financial and environmental sustainability.

OBJECTIVES

Design and execute a land management plan that fosters soil health and provides adaptive management options that can be replicated to ultimately balance financial and environmental sustainability.

Objectives are:

1. Maintain healthy and balanced ecosystem.
2. Utilize best management practices.
3. Build a replicable model for agronomic sustainability.
4. Monitor groundwater flow and quality.
5. Study changes in quality of soil pore water under various cropping rotations.

Potential for nitrate impact to groundwater is of concern due to the coarse-textured soils and shallow ground water tables, to address this, RDO and CLC will be implementing:

Best Management Practices

- Innovative cropping practices to reduce nitrate loss
- Growing low nitrogen demanding crops
- Following each crop with a cover crop to capture and hold nitrogen for following season.

- Monitoring and adaptive management
- Utilizing U of M nitrogen guidelines
- Split nitrogen applications
- Incorporation of nitrogen fertilizers
Related Components:
 - Progressive soil health management
 - Sophisticated irrigation management
 - Alternative Management Tools (AMTs)
 - Cover crops
 - Grazing
 - Extended rotation including low nitrogen demanding crops



TEAM MEMBERS

Central Lakes College (Primary Site Operators)

- Keith Olander, Dean of Ag Studies
- Hannah Swartzentruber, Ag & Energy Research Manager
- Todd Pollema, Ag & Energy Center Farm Manager

RDO (Site owners)

- Charles Jacobson, Seed Farm Manager
- Nick David, Regional Agronomist
- Keith McGovern, CEO

SUPPORTING COLLABORATORS

MN Department of Ag

- Ryan Perish, Soil Scientist
- Luke Stuewe, Soil Scientist
- Jeppe Kjaersgaard, Research Scientist

Sustainable Farming Association

- Kent Solberg, Cover Crop & Grazing Specialist

NWATS

- Daniel Whitney, Principal Hydrogeologist
- Kristi Anderson, Project Hydrogeologist

Other

- Dan Vogt, Location Manager, Midwest Machinery
- Mike Sams, Local Cattle Owner
- Roy Bell, Local Cattle Owner
- Emil Sirucek, Local Cattle Owner

Byron Township Water Quality Study



Evaluating Nitrate Movement Beneath Irrigated Crops on Coarse Textured Soils Converted from Timberland to Cropland

In cooperation with



Land use transitions from managed timberland to irrigated row crop production in Minnesota have drawn interest from a wide range of organizations, agencies and other stakeholders across the state. A collaborative, long-term field study began in 2014 to monitor nitrate movement in the soil and groundwater beneath one recently transitioned field in Cass County, Minnesota. To accomplish these goals, the field has been instrumented with suction tube lysimeters, drain gauges and monitoring wells.

CENTRAL LAKES COLLEGE

Ag and Energy Center

Corn and Soybean Brand Demonstration Report



1830 Airport Road | Staples MN 56479
218-894-5141 | clcagandenergy.org

***NOTE:**

This report is a demonstration trial. Seed companies enter varieties into this trial that have differing maturities. These varieties are then planted into 10 foot by 480 foot strips by order for maturity. This report includes a listing of the varieties as planted by maturity and a listing of the varieties in order of yield for each maturity group.



CLC is committed to legal affirmative action, equal opportunity, and access and diversity of its campus community. This document is available in alternative formats. Consumers may also contact us via their preferred telecommunication Relay Service.

CORN BRAND DEMONSTRATION REPORT - 2023

Central Lakes College Agriculture and Energy Center

<p>Date Planted: May 16, 2023</p> <p>Date Harvested: October 20, 2023</p> <p>Starter Fertilizer: 30-0-60-10</p> <p>In-Furrow: Lumen 3 gal/A, Unlock 2 oz/A</p> <p>Topdress Fertilizer: 90-0-0-10</p> <p>Fertigation: 25% @ 8gal/A X3</p> <p>Herbicide: Wheelhouse @ 18oz/A, Atrazine @ 12oz/A, Armezon Pro 15oz/A, Detonate @ 3oz/A</p>	<p>Planted Population: 34,000</p> <p>Previous Crop: Soybeans</p> <p>Tillage: fall ripped, spring highspeed</p> <p>Irrigated: 8.5 inches</p> <p>Plot Size: 4 - 30 inch rows, 4 rows Sampled</p> <p>Stand Count Date: July 11, 2023</p> <p>Notes:</p>
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*** LISTED AS PLANTED ***

Company Name	Brand	Maturity	Stand count	Test Weight	% Moist.	Yield
Allegiant	8037	80	33,000	55	18.5	226.60
Syngenta	NK8005V	80	32,000	54.4	21.1	219.99
Allegiant	8187	81	35,000	53.9	20.5	223.56
Syngenta	NK8232AA	82	34,000	54	19.9	216.98
Becks	3210V2P	82	31,000	54.2	21.4	217.91
Renk	RK223RR	82	33,000	52.9	20.1	236.11
Dekalb	32-35	82	34,000	55.9	19.2	240.06
Croplan	2423VT2P	84	32,000	53.6	19.9	224.61
Allegiant	8482	84	33,000	53.9	19.7	229.00
Syngenta	NK8519V	85	36,000	54.7	20.7	200.32
Dahlman	R42-28VT2PRIB	85	33,000	55.3	19.3	205.14
Syngenta	NK8558AA	85	33,000	53.6	20.5	202.72
Dahlman	3088PCW	85	32,000	54.9	20.2	197.78
Allegiant	8537	85	33,000	54.5	19.7	224.54
Enestvedt Seed Co.	E859 Conv	86	33,000	54.6	20	230.05
Syngenta	NK8618AA	86	35,000	54.8	20.5	214.72
Dahlman	R43-24VT2PRIB	86	32,000	53.9	21.1	213.10
Dekalb	36-48	86	32,000	53	19.8	222.98
Becks	3627BZ	86	33,000	54.2	20.3	217.79
Allegiant	8704	87	32,000	55.1	19.6	205.02
Pioneer	P87040AM	87	33,000	55.2	20.4	232.70
Becks	3753V2P	87	33,000	54.2	21.2	214.71
Renk	RK297VT2P	89	30,000	53.3	21.1	240.05
Allegiant	8990	89	32,000	54	20.7	224.26
Dekalb	39-55	89	33,000	54	20.5	215.35
Syngenta	NK9021D	90	34,000	54.4	20.2	199.05
Renk	RK300RR	90	27,000	54.4	21.4	222.28
Syngenta	NK9044AA	90	34,000	54.6	20.3	200.70
Pioneer	P90630AM	90	33,000	54.5	20.6	214.45

Becks	4001V2P	90	32,000	54.7	22.4	230.55
Dahlman	R45-236VT2PRIB	91	30,000	55.1	22.1	225.87
Syngenta	NK9175DV	91	34,000	54.1	22.8	218.93
Renk	RK400VT2P	91	35,000	54.2	21.9	227.69
Allegiant	9109	91	32,000	54.7	20.8	232.16
Dekalb	41-55	91	36,000	55.1	20.1	230.40
Stine	9320-20	91	32,000	54.1	20.4	226.37
Enestvedt Seed Co.	E612 Conv	92	34,000	54.2	21.2	229.11
Syngenta	NK9231AA	92	32,000	52.5	21	239.73
Croplan	3223VT2P	92	36,000	54.9	21.5	248.19
Renk	RK444VT2P	93	33,000	53.9	21.5	238.83
Enestvedt Seed Co.	E621 Conv	94	34,000	52.8	21.8	206.86
Renk	RK485DGV2P	94	30,000	54.5	21.8	229.22
Allegiant	9484	94	34,000	53.8	22.3	219.73
Enestvedt Seed Co.	E654 Conv	95	34,000	53.5	20.6	228.33
Enestvedt Seed Co.	E658 Conv	95	36,000	54	20.6	216.97
Syngenta	NK9535V	95	35,000	54.7	20.5	234.30
Enestvedt Seed Co.	E658 VT2	95	34,000	52.9	21.1	245.07
Enestvedt Seed Co.	E652 Conv	95	33,000	56	20	222.43
Dahlman	3096PCW	96	35,000	52.2	21.5	240.08
Dahlman	R48-239VT2PRIB	96	33,000	53.8	22.8	248.37
Allegiant	9747	97	34,000	54.6	22.7	249.92
Stine	MX302-G	96	30,000	45.6	26	212.21

Brand Test Weight Average	54.1
Brand Moisture Average	20.9
Brand Yield Average	223.7

RANKED BY YIELD OF MINNESOTA MATURITY

***** Sorted by Yield*****

80-85 Day Minnesota Maturity

Company	Brand	Maturity	Stand Count	Test Weight	% Moist.	Yield
Dekalb	32-35	82	34,000	55.9	19.2	240.06
Renk	RK223RR	82	33,000	52.9	20.1	236.11
Allegiant	8482	84	33,000	53.9	19.7	229.00
Allegiant	8037	80	33,000	55	18.5	226.60
Croplan	2423VT2P	84	32,000	53.6	19.9	224.61
Allegiant	8537	85	33,000	54.5	19.7	224.54
Allegiant	8187	81	35,000	53.9	20.5	223.56
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Syngenta	NK8519V	85	36,000	54.7	20.7	200.32
Dahlman	3088PCW	85	32,000	54.9	20.2	197.78

85 Day or Less Test Wgt Average	54.3
85 Day or Less Moisture Average	20.1
85 Day or Less Yield Average	219.0

RANKED BY YIELD OF MINNESOTA MATURITY

86-91 Day Minnesota Maturity

Company	Brand	Maturity	Stand Count	Test Weight	% Moist.	Yield
Renk	RK297VT2P	89	30,000	53.3	21.1	240.05
Pioneer	P87040AM	87	33,000	55.2	20.4	232.70
Allegiant	9109	91	32,000	54.7	20.8	232.16
Becks	4001V2P	90	32,000	54.7	22.4	230.55
Dekalb	41-55	91	36,000	55.1	20.1	230.40
Enestvedt Seed Co.	E859 Conv	86	33,000	54.6	20	230.05
Renk	RK400VT2P	91	35,000	54.2	21.9	227.69
Stine	9320-20	91	32,000	54.1	20.4	226.37
Dahlman	R45-236VT2PRIB	91	30,000	55.1	22.1	225.87
Allegiant	8990	89	32,000	54	20.7	224.26
Dekalb	36-48	86	32,000	53	19.8	222.98
Renk	RK300RR	90	27,000	54.4	21.4	222.28
Syngenta	NK9175DV	91	34,000	54.1	22.8	218.93
Becks	3627BZ	86	33,000	54.2	20.3	217.79
Dekalb	39-55	89	33,000	54	20.5	215.35
Syngenta	NK8618AA	86	35,000	54.8	20.5	214.72
Becks	3753V2P	87	33,000	54.2	21.2	214.71
Pioneer	P90630AM	90	33,000	54.5	20.6	214.45
Dahlman	R43-24VT2PRIB	86	32,000	53.9	21.1	213.10
Allegiant	8704	87	32,000	55.1	19.6	205.02
Syngenta	NK9044AA	90	34,000	54.6	20.3	200.70
Syngenta	NK9021D	90	34,000	54.4	20.2	199.05

86-91 Day Test Wgt. Avg.	54.4
86-91 Day Moisture Average	20.8
86-91 Day Yield Average	220.9

RANKED BY YIELD OF MINNESOTA MATURITY

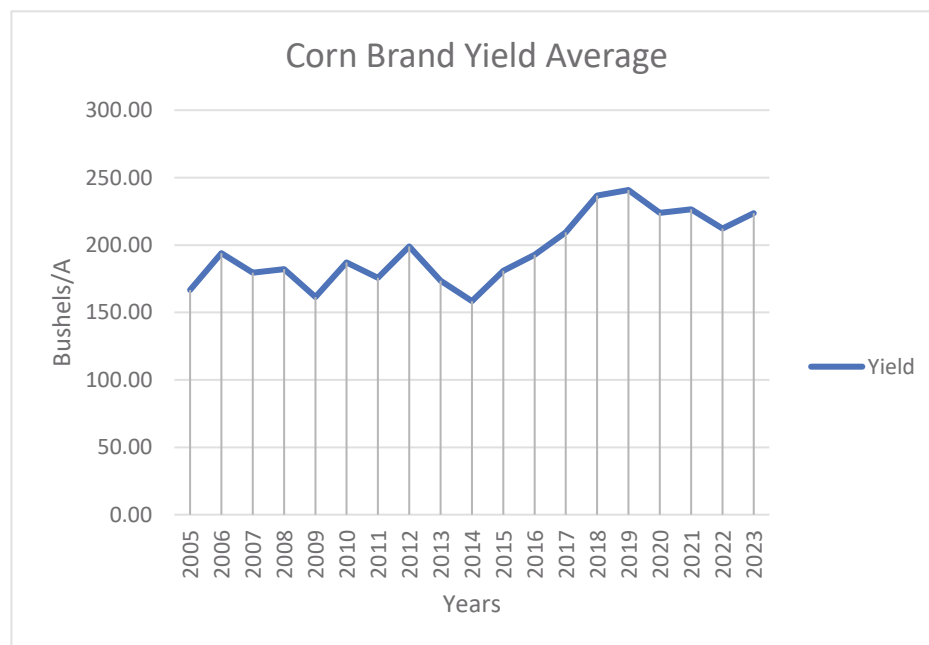
92-97 Day Minnesota Maturity

Company	Brand	Maturity	Stand Count	Test Weight	% Moist.	Yield
Allegiant	9747	97	34,000	54.6	22.7	249.92
Dahlman	R48-239VT2PRIB	96	33,000	53.8	22.8	248.37
Croplan	3223VT2P	92	36,000	54.9	21.5	248.19
Enestvedt Seed Co.	E658 VT2	95	34,000	52.9	21.1	245.07
Dahlman	3096PCW	96	35,000	52.2	21.5	240.08
Syngenta	NK9231AA	92	32,000	52.5	21	239.73
Renk	RK444VT2P	93	33,000	53.9	21.5	238.83
Syngenta	NK9535V	95	35,000	54.7	20.5	234.30
Renk	RK485DGV2P	94	30,000	54.5	21.8	229.22
Enestvedt Seed Co.	E612 Conv	92	34,000	54.2	21.2	229.11
Enestvedt Seed Co.	E654 Conv	95	34,000	53.5	20.6	228.33
Enestvedt Seed Co.	E652 Conv	95	33,000	56	20	222.43
Allegiant	9484	94	34,000	53.8	22.3	219.73
Enestvedt Seed Co.	E658 Conv	95	36,000	54	20.6	216.97
Stine	MX302-G	96	30,000	45.6	26	212.21
Enestvedt Seed Co.	E621 Conv	94	34,000	52.8	21.8	206.86

92 - 97 Day Test Wgt Average	53.4
92 - 97 Day Moisture Average	21.7
92 - 97 Day Yield Average	231.8

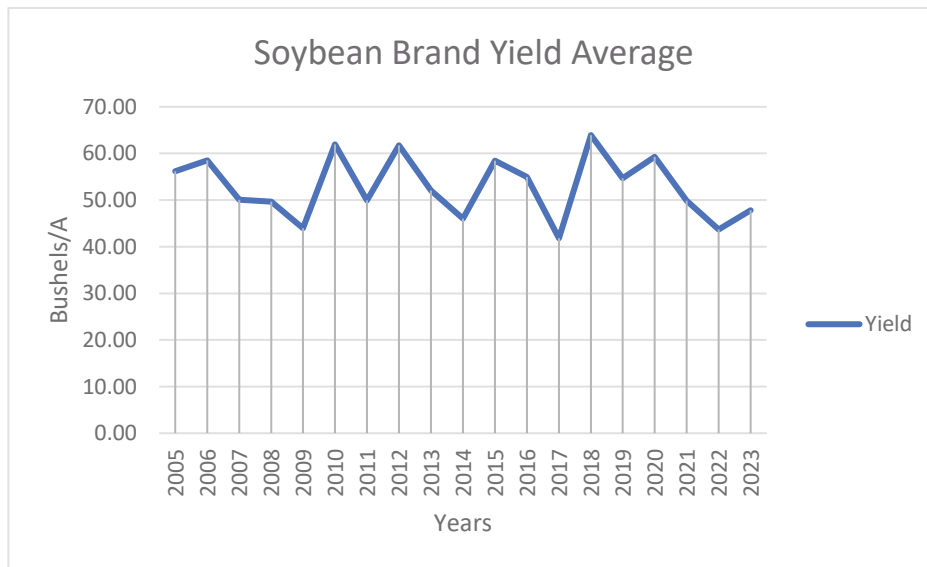
Corn and Soybean Yield Averages over the Years

Historical Corn Averages				
	Test Wt.	% Moisture	Yield	Adjusted Yield
2005	54.00	21.20	166.60	173.80
2006	56.00	19.40	193.90	187.80
2007	55.00	19.40	179.40	179.30
2008	52.00	22.30	182.00	182.10
2009	48.00	30.50	161.50	161.40
2010	56.50	17.80	187.00	187.00
2011	56.00	17.00	175.80	175.70
2012	59.00	15.50	199.00	199.10
2013	54.00	21.20	173.60	173.60
2014	54.00	13.90	158.40	158.30
2015	57.00	18.60	180.90	181.30
2016	55.00	20.20	192.70	192.50
2017	54.10	19.10	209.50	208.60
2018	53.70	21.90	236.60	236.30
2019	52.30	23.80	240.80	239.80
2020	55.90	17.40	223.90	223.10
2021	54.10	19.80	226.40	226.50
2022	54.40	19.70	212.20	NA
2023	54.10	20.90	223.70	NA



Corn and Soybean Yield Averages over the Years

Historical Soybean Averages			
	Test Wt.	% Moisture	Yield
2005	57.26	12.89	56.15
2006	56.57	13.88	58.53
2007	56.75	13.00	50.09
2008	56.91	15.49	49.69
2009	55.78	17.01	43.95
2010	56.60	11.37	61.95
2011	57.80	8.60	49.93
2012	56.68	9.98	61.72
2013	56.85	12.21	52.07
2014	55.95	10.54	46.01
2015	57.14	10.70	58.43
2016	56.98	13.37	54.92
2017	55.81	11.60	41.82
2018	56.78	14.16	63.93
2019	55.00	15.90	54.70
2020	57.79	10.87	59.24
2021	53.90	11.80	49.90
2022	58.10	10.60	43.72
2023	57.99	13.31	47.82



Soybean brand Demonstration Report - 2023

Yield as Planted

Central Lakes College Ag and Energy Center

Date Planted: 19-May-23

Date Harvested: 12-Oct-23

Plant Population: 149,000

Previous Crop: Corn

Starter Fertilizer: 10-10-45-10

Irrigated: 8.5 inches

Fertigation: NA

Plot Size: 4, 30 inch rows harvested

Herbicides: Basagran @ 32oz/A,
Raptor @ 32oz/A, Penetrec @ 8oz/A,
AMS @ 3lbs/A

Tillage: Fall ripped, Spring Mulch finisher

South

	Company	Variety	Type of Cross	Maturity	Total Weight	Moisture	Test Weight	Row Length	Yield
1	Renk	G018E		0.1	380	12.6	58.1	570	48.62
2	Syngenta	NK03-V5E3	Enlist	0.3	335	12.5	57.3	570	42.91
3	Pioneer	Po4A98E		0.4	330	12.5	57.5	570	42.27
4	Renk	G0570E		0.5	385	12.4	57.7	570	49.38
5	Syngenta	NK05-W3XF	Xtend	0.5	350	12.7	58.3	570	44.73
6	BASF	0554E		0.5	350	12.7	58.6	570	44.73
7	Syngenta	NK06-P2XF	Xtend	0.6	335	12.5	57.6	570	42.91
8	BASF	0602E		0.6	330	12.5	57.5	570	42.27
9	Syngenta	NK06-D9E3	Enlist	0.6	360	12.3	57.8	570	46.22
10	Dahlman	AE0710		0.7	380	12.5	58	570	48.68
11	Renk	G0750E		0.7	375	12.7	59.3	570	47.93
12	Syngenta	NK07-G5E3	Enlist	0.7	395	12.6	58.5	570	50.54
13	Allegiant	07E63N		0.7	350	12.7	59.7	570	44.73
14	Renk	G0880E		0.8	365	13.2	59	570	46.38
15	Croplan	0820E	Enlist	0.8	400	13	58.5	570	50.95
16	Allegiant	A09E33N		0.9	375	13.4	57.7	570	47.54
17	Syngenta	NK09-H7E3	Enlist	0.9	330	13.4	57.6	570	41.84
18	Allegiant	09E13N		0.9	420	13.3	57.3	570	53.31
19	Syngenta	NK09-B5XF	Xtend	0.9	395	13.2	58.9	570	50.19
20	BASF	0993E		0.9	350	13.1	57	570	44.53
21	Dahlman	7210XF		1	375	13.4	55.9	570	47.54
22	Renk	G1070E		1	400	14	56.5	570	50.36
23	Croplan	CP1130E	Enlist	1.1	445	14	55.8	570	56.03
24	Syngenta	NK11-U2XF	Xtend	1.1	485	15.1	55.6	570	60.28
25	Allegiant	11E93N		1.1	520	16.3	55.3	570	63.72
26	Syngenta	NK11-A43E	Enlist	1.1	480	14.1	68.5	570	60.36
27	Dahlman	AE1220		1.2	340	15.3	57.2	570	42.16
28	Renk	G1260E		1.2	300	14.6	57.2	570	37.51
29	Dahlman	7412XF		1.2	300	13.5	57.8	570	37.99

Average Yield:	47.82
Average Moisture:	13.31
Average Test Weight:	57.99

Soybean Brand Demonstration Report -2023

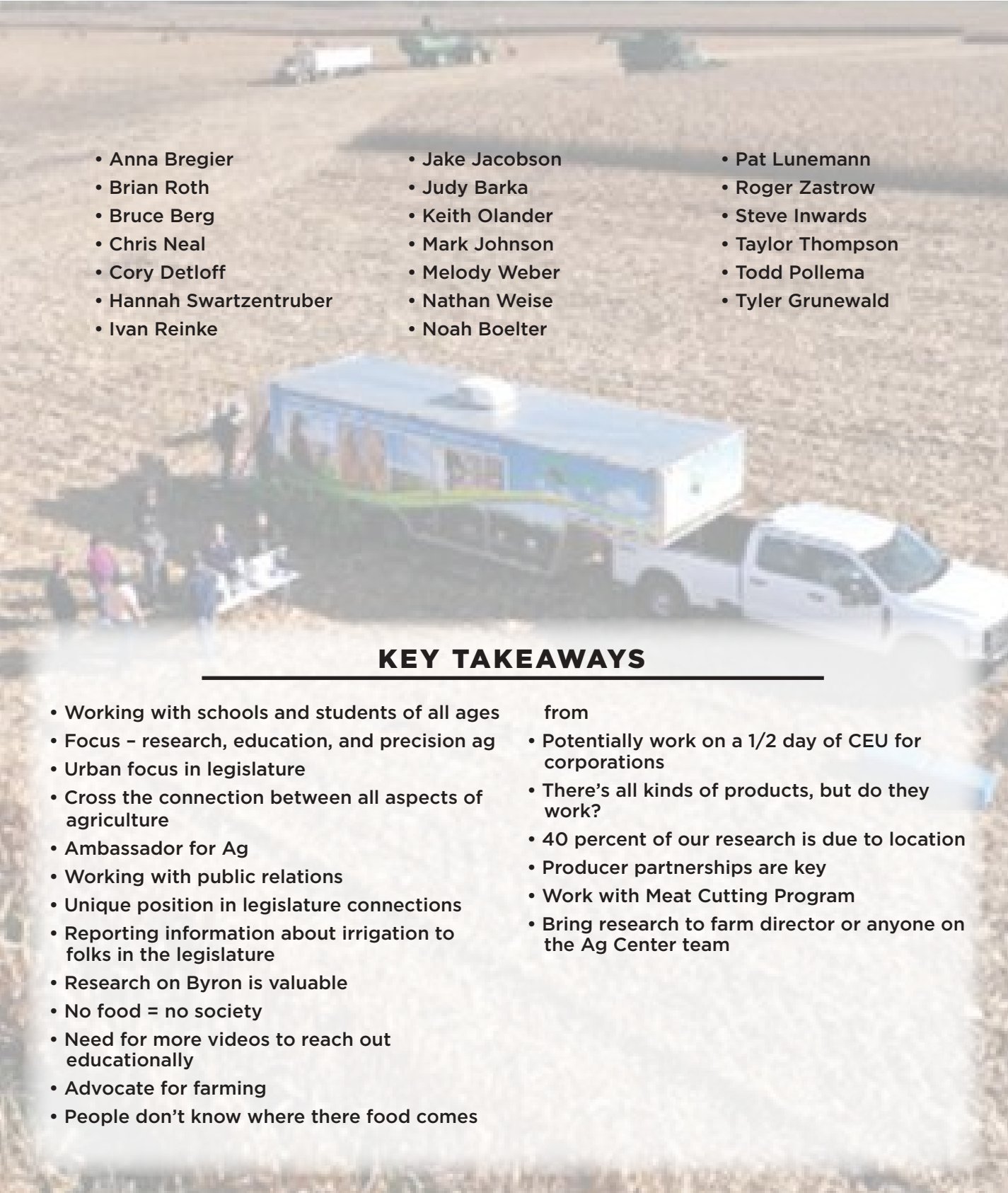
Ranked By Yield

Central Lakes Ag and Energy Center

	Company	Variety	Type of Cross	Maturity	Total Weight	Moisture	Test Weight	Row Length	Yield
1	Allegiant	11E93N		1.1	520	16.3	55.3	570	63.72
2	Syngenta	NK11-A43E	Enlist	1.1	480	14.1	68.5	570	60.36
3	Syngenta	NK11-U2XF	Xtend	1.1	485	15.1	55.6	570	60.28
4	Croplan	CP1130E	Enlist	1.1	445	14	55.8	570	56.03
5	Allegiant	09E13N		0.9	420	13.3	57.3	570	53.31
6	Croplan	0820E	Enlist	0.8	400	13	58.5	570	50.95
7	Syngenta	NK07-G5E3	Enlist	0.7	395	12.6	58.5	570	50.54
8	Renk	G1070E		1	400	14	56.5	570	50.36
9	Syngenta	NK09-B5XF	Xtend	0.9	395	13.2	58.9	570	50.19
10	Renk	G0570E		0.5	385	12.4	57.7	570	49.38
11	Dahlman	AE0710		0.7	380	12.5	58	570	48.68
12	Renk	G018E		0.1	380	12.6	58.1	570	48.62
13	Renk	G0750E		0.7	375	12.7	59.3	570	47.93
14	Allegiant	A09E33N		0.9	375	13.4	57.7	570	47.54
15	Dahlman	7210XF		1	375	13.4	55.9	570	47.54
16	Renk	G0880E		0.8	365	13.2	59	570	46.38
17	Syngenta	NK06-D9E3	Enlist	0.6	360	12.3	57.8	570	46.22
18	Syngenta	NK05-W3XF	Xtend	0.5	350	12.7	58.3	570	44.73
19	BASF	0554E		0.5	350	12.7	58.6	570	44.73
20	Allegiant	07E63N		0.7	350	12.7	59.7	570	44.73
21	BASF	0993E		0.9	350	13.1	57	570	44.53
22	Syngenta	NK03-V5E3	Enlist	0.3	335	12.5	57.3	570	42.91
23	Syngenta	NK06-P2XF	Xtend	0.6	335	12.5	57.6	570	42.91
24	Pioneer	Po4A98E		0.4	330	12.5	57.5	570	42.27
25	BASF	0602E		0.6	330	12.5	57.5	570	42.27
26	Dahlman	AE1220		1.2	340	15.3	57.2	570	42.16
27	Syngenta	NK09-H7E3	Enlist	0.9	330	13.4	57.6	570	41.84
28	Dahlman	7412XF		1.2	300	13.5	57.8	570	37.99
29	Renk	G1260E		1.2	300	14.6	57.2	570	37.51

Average Yield:	47.82
Minimum Yield:	37.51
Maximum Yield:	63.72

A Special “Thank you” to our 2023 Advisory Board Members

- 
- Anna Bregier
 - Brian Roth
 - Bruce Berg
 - Chris Neal
 - Cory Detloff
 - Hannah Swartzentruber
 - Ivan Reinke
 - Jake Jacobson
 - Judy Barka
 - Keith Olander
 - Mark Johnson
 - Melody Weber
 - Nathan Weise
 - Noah Boelter
 - Pat Lunemann
 - Roger Zastrow
 - Steve Inwards
 - Taylor Thompson
 - Todd Pollema
 - Tyler Grunewald

KEY TAKEAWAYS

- Working with schools and students of all ages
- Focus - research, education, and precision ag
- Urban focus in legislature
- Cross the connection between all aspects of agriculture
- Ambassador for Ag
- Working with public relations
- Unique position in legislature connections
- Reporting information about irrigation to folks in the legislature
- Research on Byron is valuable
- No food = no society
- Need for more videos to reach out educationally
- Advocate for farming
- People don't know where there food comes from
- Potentially work on a 1/2 day of CEU for corporations
- There's all kinds of products, but do they work?
- 40 percent of our research is due to location
- Producer partnerships are key
- Work with Meat Cutting Program
- Bring research to farm director or anyone on the Ag Center team

Narrative about Hazelnuts at Staples | 2023



Hybrid hazelnuts, which are a cross between native American hazelnuts and domesticated European hazelnuts, were first planted at the Staples Ag Center in 2000. That first planting was comprised of seed propagated plants, which means that every single plant was genetically unique and therefore performed unpredictably. Although most of the plants in this planting bore only mediocre or poor nut loads, we identified seven above-average individuals from it for further evaluation in replicated trials. We cloned the seven via a very old process called mound layering (described below), planted them in triplicate in three replicated trials alongside top selections from other sites, then, after seven to eight years of evaluation, chose the best of those. Of the seven we originally selected from Staples, we selected three to move forward to the next stage of evaluation in the University of Minnesota's hazelnut breeding program. One of those, StapN7-6, is now among the first five to be commercialized.

One of the positive attributes of "StapN7-6" is that it propagates easily, which is one of the most important traits needed to become a commercial cultivar. Other traits, such as nut quality and high yield, are important, but don't matter if we can't propagate a plant. StapN7-6 has moderately high yields and nuts that are big enough and shell out well enough to be commercially viable. However, it is the ease with which we are able to propagate it that is the primary reason why we are moving it forward, because challenges with propagation have, until now, been the number one bottleneck in commercializing hybrid hazelnuts.

Mound Layering (aka "stool bed layering")

In 2023, for a third year in a row, we mound layered 28 mother plants of two selections at Staples, one of them being "StapN7-6". To mound layer a shrub, first you cut it down to ground level (coppice it) in the winter. In the spring the plant sends up new shoots. By mid-summer (early July), when the new shoots are as thick as pencils, you girdle them by twisting wires around their bases, near ground level. Then you paint rooting compound on the stems above the girdle and "mound" moist sawdust around the stems to a depth of about 10 inches, creating moist dark conditions conducive to growing roots. If all goes well, the stems grow roots into the sawdust just above the girdle. Then in late fall after leaf-drop, most of the stems can



be dug up and transplanted as individual new plants. Maintaining even moisture in the sawdust is key to making this work because roots will not grow into a dry medium. The past few years of summer drought have made our

mound layering efforts challenging, but, thanks to a new center-pivot irrigation system that watered our hazelnut stool beds at Staples, we had excellent rooting at Staples this year, and produced a lot of plants that will make a significant contribution to our state-wide research program.

In 2023 we experimented with a slightly different approach to layering, an approach we hope will reduce the labor involved in the process: we tried skipping the girdling step on a few of the plants. Because girdling is incredibly labor intensive, it is not something that commercial nurseries will likely be willing to do. Because, in order to commercialize hazelnut production we will need nurseries to do our propagation for us, it will be essential for us

to figure out propagation approaches that are more feasible for them. Omitting the girdling step reduced rooting on both selections, but on StapN7-6 reduced it by an amount that might be commercially viable. In 2024 we'll experiment with other methods that might increase rooting even without the girdling.



Variety Trials.

One of the youngest hazelnut plantings at the Staples Ag Center is a variety trial. We are comparing top selections from the Midwest with top selections and cultivars from hazelnut breeding programs elsewhere in eastern North America, to see how well they survive the harsh winters of Central Minnesota. Selections from Grimo Nut Nursery in Ontario are now mature, and one “Northern Blais” looks very promising, not just at Staples but also in St. Paul and Madison Wisconsin. The two selections from Nebraska, ‘The Beast’ and ‘Grand Traverse’, which are the only two selections that are commercially available, struggled to get established, but now seem to be catching up in Madison. We still do not recommend them for Central Minnesota but they might be okay for growers who are prepared to provide winter protection (such as floating row cover) during the establishment years. It is still too early to make recommendations about our Midwest selections, that were established three years after the Grimo and Nebraska selections, but preliminary results suggest they have potential.

In 2023 we cleared out an older hazelnut trial to make room for another variety trial, this one comprised of our top “2nd generation” Midwest hazelnut selections. These are progeny of controlled crosses we made between our top 1st

generation Midwest selections and top selections of European hazelnuts from Oregon. We planted them as seedlings at Rosemount in fall 2015 and have now selected the top 30, which layered to produce clones that we will plant into replicated trials at Staples and elsewhere in spring 2024. If they can survive Staples’ harsh winters we ought to have some real winners to give to the public in seven or eight years or so.

For more information about the hazelnut project, go to www.midwesthazelnuts.org



Evaluating Nitrogen Fertilizer guidelines for dry bean production in Minnesota

Year 2 of 3 Progress Report
Small plot N Rate Trials by Daniel Kaiser – U of M

Dry beans have been an important commodity crop in the state of Minnesota with around 250,000 acres planted in 2020 and 2021. No major research efforts have been put into the evaluation of current fertilizer guidelines in nearly twenty years including nitrogen which is a common nutrient needed for dry bean production. While it is plausible that nitrogen rates required to maximize dry bean yield have not changed, more current research is beneficial with black beans being increasingly grown across the state.

Current fertilizer guidelines for dry beans in Minnesota are yield goal based so technically any dry bean classes that would be higher yielding would necessitate modifications in a dry bean growers normal fertilizer practice. However, we have found that yield potential for a of a crop each year is not strongly related to the amount of fertilizer required. This has caused a shift away from fertilizer guidelines based on expected yield of the crop, especially for nitrogen. Concerns over yield loss by lack of N balanced with increased potential for yield loss due to disease from over application of nitrogen require refined fertilizer guidelines. The Minnesota publication for dry bean fertilizer guidelines has been updated recently but the fertilizer guidelines remained unchanged from past publications.

Funding through the Northarvest bean growers has provided a renewed effort to take another look at dry bean nitrogen guidelines. Four field trials were established at three research locations in Minnesota. Unlike 2022 all trials were established at locations dedicated to research and not on Farmer fields as the trial were designed

to compare two to three classes of dry beans at each location. Field locations were established at University of Minnesota research and outreach centers location at Becker, Crookston, and Lamberton. The fourth location was at the Central Lakes College Ag and Energy Center located at Staples. ‘Eclipse’ black beans and ‘HMS Medalist’ navy beans were grown at all locations. ‘Montcalm’ medium red kidney beans were grown at Becker and Staples. Nitrogen was applied as urea as a single pre-plant application at Crookston and Lamberton in 30 lb N per acre rate increments ranging from 0 to 150 lbs N/acre. Becker and Staples were both irrigated locations, but N rates were applied up to a maximum of 210 lbs N per acre split evenly over 3 applications.

Pertinent soil test data are included for the four research trials in Table 1. A single composite soil sample was collected from each dry bean class block prior to treatment application. Samples were collected at a 0-6” sampling depth to be analyzed for nitrate-nitrogen, phosphorus, potassium, pH, and organic matter concentration. An additional sampling depth of 6-24” was analyzed or nitrate-N only. Well water samples were collected at Becker and Staples. At this time I do not have the total water applied and the nitrate-N concentration data from staples to report for 2023. At Becker, 13.21 inches were applied from May 22 through August 24. Average well water nitrate-N concentration was 4.0 ppm which would total 11.9 lbs nitrate-N applied through the irrigation water in 2023.

Table 1. Summary of soil test properties for the three small plot on-farm dry bean trials conducted in 2022.

Location	Bray-P1 Phosphorus	Soil test Potassium	Soil pH	Soil Organic Matter	Nitrate-N
	ppm	ppm		%	lb N/ac
Crookston	10 ¹	124	8.1	3.7	34
Lamberton	25	192	5.4	4.2	37
Becker	86	109	6.9	1.9	18
Staples	66	219	6.3	4.5	44

1/ Olsen P test is reported

Table 2.

Summary of the concentration of total nitrogen in dry bean seed based on class at the four locations in 2023. Numbers followed by the same letter within a row are not significantly different at $P < 0.05$.

	Black	Kidney	Navy	$P > F$
	%			
Becker	3.18b	3.59a	3.10c	***
Crookston	3.07	--	3.05	0.72
Lamberton	3.21a	--	2.93b	***
Staples	3.31b	3.78a	3.30b	***

Asterisk denote significant at $P < 0.001$ (***), 0.01 (**), and 0.05 (*)

Grain was saved to be analyzed for total N concentration. Data are reported in Table 2. Nitrogen application rate did affect the concentration of N in grain, but the impact of N was consistent across all classes within each location. The nitrogen rate impacts on grain N concentration will not be reported in this report. Grain total N concentration varied among dry bean classes at three of the four locations. For the two irrigated locations, total N concentration was greatest for kidney beans compared to black and navy beans. Total N concentration was similar for black versus navy beans at two of the four locations and only differed at Becker and Lamberton. I will continue to track total N concentration based on class. The 2024 continuation includes funding to continue analysis on the grain collected in this study.

The impact of nitrogen rate on dry bean yield tended to fit a quadratic model where yield increased to a certain point at which then further additions of nitrogen decreased yield. At Crookston, dry bean yield was maximized with 110-114 lbs of N applied as urea compared to Lamberton where 105-110 lbs of N was needed. The main result of note here is that there was no difference in the required N based on class at the two responsive locations. The lack of an N response at Becker and Staples was unexpected as there were clear visual differences that could be seen with visibly yellow plants in the low N plots in early July (Photo 1). None of the plants were inoculated, which might explain the lack of response. More data will be beneficial to help fine tune N rate guidelines.

Yield data are summarized for each bean class in Figures 1, 2, and 3. Yield was only impacted by nitrogen application rate at Crookston and Lamberton. While the effect of nitrogen rate was significant at Crookston and Lamberton, there was significant N rate by class interaction indicating a similar N rate response at both locations. At Crookston, there was no yield differences between the two classes while average navy bean yield was greater 450 lbs per acre greater at Lamberton.



Photo 1. Taken on July 3, 2023 at Staples MN, showing the transition between N sufficient (front) and deficient (back) dry bean plants.

On-Farm Dry Bean Nitrogen Trial

Noah Boelter & Hannah Swartzentruber - CLC

This study was conducted on a 50 acre field under irrigation on the sand plains of Central Minnesota. The western half of this pivot was utilized for this trial. The western half was divided into two quadrants. The northern and southern halves were divided into 60 foot strips that were flagged off. There were eight strips on either side of the pivot point. There were two different top dress applications of 40 and 60 units of N. All the other applications of nitrogen were kept the same across the two treatments including preplant, in-furrow, and fertigation. The control application of nitrogen was 80 units of N applied at top dress. The total amounts of nitrogen that were applied were 136 units of N for the control treatment, 116 units for the first nitrogen reduction rate, and 96 units for the last reduction rate. The 116 unit strips were compared to the 136 units on the southern half. The 96 units were compared to the 136 units in the northern quadrant. Figure one is a picture of the trial field layout.

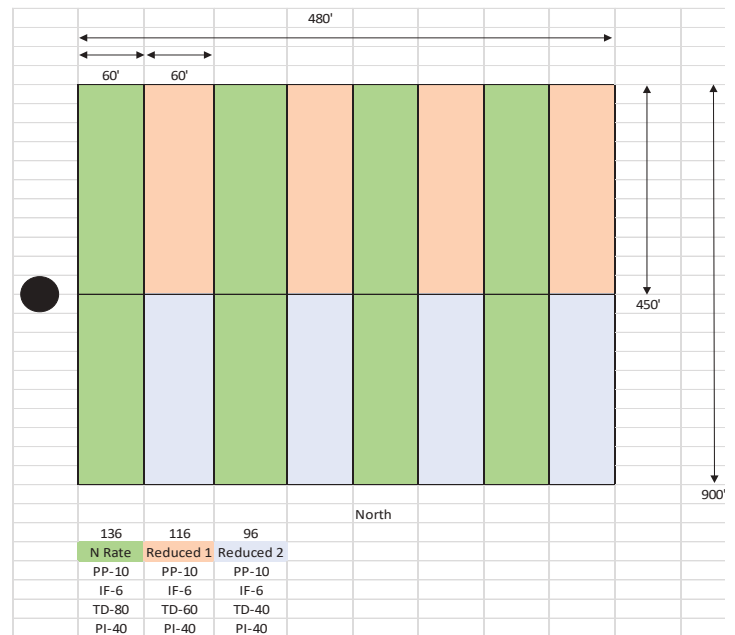
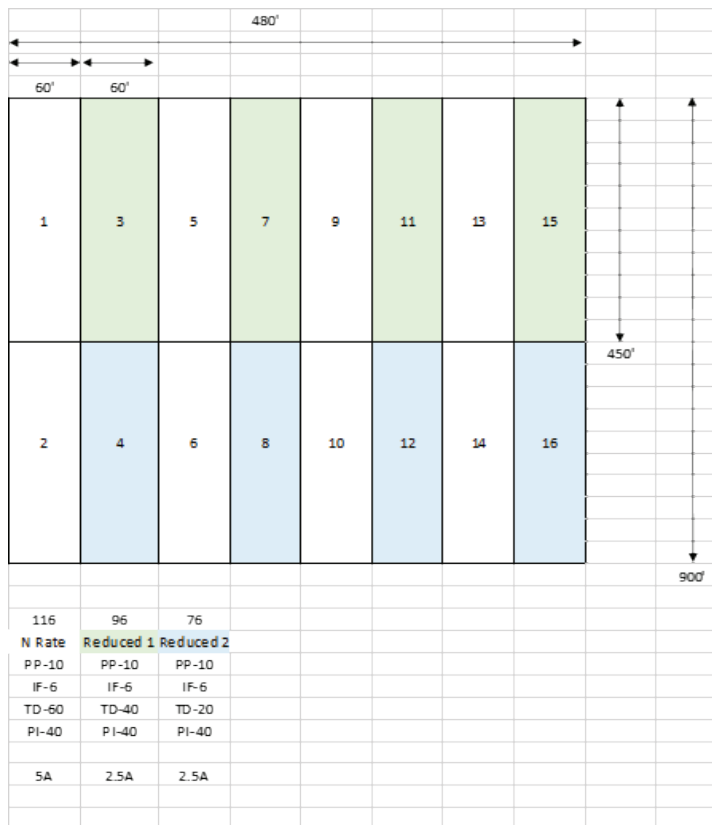


Figure 1 (Field plan layout)



This trial was planted June 6, 2022. The top dress applications were all applied on July 5, 2022. Then the trial was harvested September 12, 2022. A weigh wagon was used to collect harvest data. The data is as follows.

As you can see from the data to the left, the average yield of the kidney beans that were on the northern half were 2098.92 with the application of N reduced by 40 units of nitrogen. The control that these were compared to were 80 units of N. The normal rate out-yielded the 40 unit top dress application by 9.86 units. Then on the southern half of the pivot, the average reduced rate of 60 units of top dress out yielded the average of the 80 units of top dress by 25.01 pounds.

A field trial was established at a field location near Staples to look at reduced nitrogen rates for dry bean production under irrigation. Treatments were applied in large blocks areas 60 feet wide by 450 feet long comparing rates of nitrogen applied around the V5 growth stage. The standard practice at the location of 80 lbs of N applied at V5 was compared to 60 and 40 lbs of N. An additional rate of 56 lbs of N was applied as a combination of pre-plant, starter, and post V5 fertigated N for a total of 136 lbs of N applied as the standard practice and 116 and 96 lbs as the reduced rates. Common bacterial blight was present in the field which reduced yield in 2022. Analysis of the data showed no statistical differences between the standard practice and the

two reduced fertilizer rates (Figure 4). Actual yield values were within 35 lbs of each other, or about a 1.5% variation in yield among the treatments.

Research was continued in 2023 but a reduced rate of N was applied focusing on 20, 40, and 60 lbs of N. Data from 2023 are presented in Figure 4. Statistical analysis indicated no difference among the V5 rates in 2023 even though the general trend was for slightly higher yield with the 60 lb application rate which is like what was found in 2022. If funded, this trial will be repeated in 2024. Similar rate are planned in 2023 which were used in 2023.

Figure 3. Summary of on-farm irrigated dry bean data collected near Staples, MN in 2022.

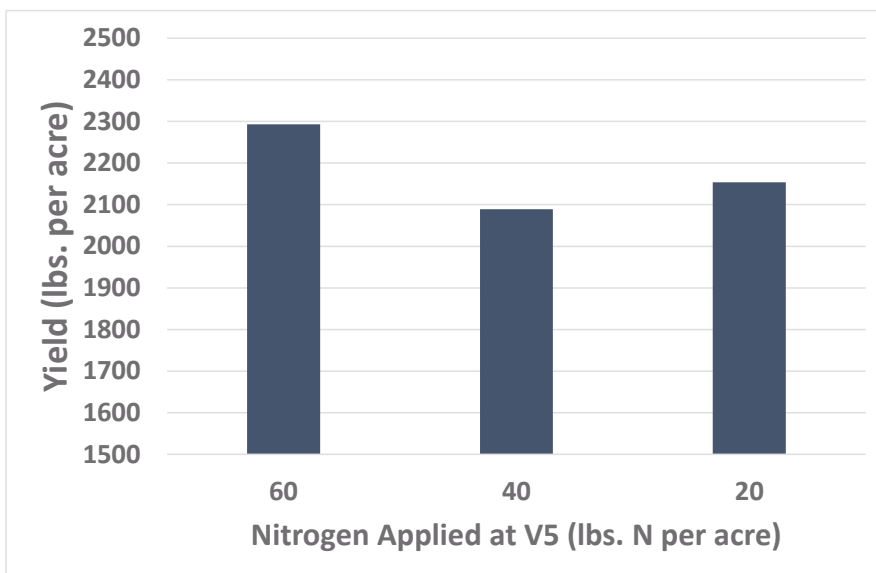
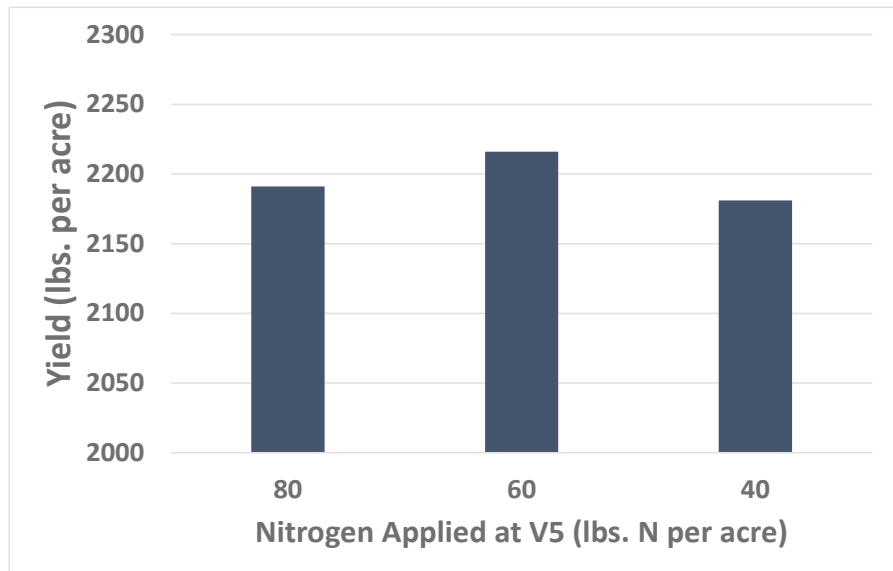


Figure 4. Summary of on-farm irrigated dry bean data collected near Staples, MN in 2023.

Treatment	Date Harvested	Sample #	Row Length (ft.)	# of Rows	Row Width (ft.)	Weight (lbs.)	Moisture	Adjusted Moisture	Dry Sample (lbs.)	Yield lbs./A	Adjusted Yield lbs./A @18% moisture	
20 units	9/18/2023	4	444	16	2.5	990	11.8	12.34	867.83	2128.54	2511.68	
20 units	9/18/2023	12	501	16	2.5	910	10.79	11.33	806.90	1753.91	2069.62	Average of 20 units top dress of N
20 units	9/18/2023	16	426	16	2.5	815	11.14	11.68	719.81	1840.07	2171.29	2153.59
20 units	9/18/2023	8	532	16	2.5	855	9.31	9.85	770.78	1577.79	1861.79	
40 units	9/18/2023	3	307	16	2.5	620	10.79	11.33	549.75	1950.10	2301.12	
40 units	9/18/2023	7	316	16	2.5	560	12.28	12.82	488.21	1682.46	1985.31	Average of 40 units top dress of N
40 units	9/18/2023	15	330	16	2.5	505	10.53	11.07	449.10	1482.02	1748.78	2088.84
40 units	9/18/2023	11	335	16	2.5	690	11.8	12.34	604.85	1966.23	2320.15	
60 units	9/18/2023	1	317	16	2.5	640	10.79	11.33	567.49	1949.51	2300.42	
60 units	9/18/2023	2	314	16	2.5	685	10.88	11.42	606.77	2104.38	2483.17	Average of 60 units top dress of N
60 units	9/18/2023	5	307	16	2.5	590	10.88	11.42	522.62	1853.86	2187.56	2293.29
60 units	9/18/2023	6	498	16	2.5	1135	11.8	12.34	994.94	2175.68	2567.31	
60 units	9/18/2023	9	320	16	2.5	600	10.61	11.15	533.10	1814.21	2140.76	
60 units	9/18/2023	10	532	16	2.5	1105	9.11	9.65	998.37	2043.65	2411.51	
60 units	9/18/2023	13	323	16	2.5	570	9.11	9.65	515.00	1736.31	2048.85	
60 units	9/18/2023	14	476	16	2.5	920	10.61	11.15	817.42	1870.11	2206.72	

Supplementary Table 2.

Yield data summarized for the CLC on-farm trial conducted in 2023

2023 Provita Subsample Yields

CLC AG and Energy Center - Staples, MN

Planted: 6/14/2022

8 row plots

Dark Red Kidney Strip Trial Subsample Yields

Sorted By Yield

	Variety	Weight	Moisture Reading	Adjusted Moisture	100 Bean	Yield lbs/A
1	181016	1563.41	12.74	13.71	55.29	2039.00
2	Chaparral	1446.13	13.49	14.46	49.21	1870.28
3	Epic	1445.98	13.89	14.86	63.42	1859.32
4	181017	1372.09	14.71	15.68	58.83	1746.62
5	15977	1311.98	14.70	15.67	65.31	1671.34
6	161168	1299.71	14.90	15.87	46.83	1654.85
7	161164	1197.81	13.44	14.41	57.76	1545.30
8	Spire	1192.78	15.29	16.26	55.87	1502.16
9	Montcalm	1156.23	13.51	14.48	59.67	1493.68
10	Seattle	1050.33	13.44	14.41	48.96	1358.79
11	161165	1014.43	13.26	14.23	58.67	1314.62
12	161166	934.04	11.77	12.74	53.60	1231.43
13	Red Hawk	784.67	11.69	12.66	43.35	1035.76
14	161156	731.88	10.31	12.09	50.97	968.68
15	Rampart	595.33	9.86	7.24	47.72	823.58
16	181020	574.98	11.50	12.47	49.32	760.36
17	181021	NA	NA	NA	NA	NA

Maximum: 2039.00
Average: 1429.74
Minimum: 760.36

Light Red Kidney Strip Trial Subsample Yields

Sorted by Yield

	Variety	Weight	Moisture Reading	Adjusted Moisture	100 Bean	Yield lbs/A
1	161082	1709.29	11.70	12.67	52.55	2256.06
2	15923	1571.58	11.26	12.25	54.72	2083.71
3	Pink Panther	1546.83	11.60	12.59	57.13	2042.71
4	15916	1523.05	10.98	11.97	50.35	2025.47
5	Red Dawn	1406.14	11.12	12.11	58.72	1867.81
6	16998	1401.65	11.07	12.06	60.57	1862.56
7	11413	1333.74	11.46	12.45	51.91	1764.30
8	Clouseau	1251.19	11.63	12.62	56.04	1651.83
9	Big Red	1214.61	11.32	12.31	55.16	1609.56
10	Ronnies Red	752.43	9.34	10.72	69.81	1014.85

Maximum: 2256.06
Average: 1817.88
Minimum: 1014.85

2023 Provita Whole Strip Trials

CLC Ag and Energy Center - Staples, MN

Planted: 6/14/2022 8 row plots

Dark Red Kidney Whole Sample Yields (Sorted by Yield)

	Variety	Total Weight	Moisture	Adj. By Temp.	Yield	by Moisture
1	181017	430.00	14.03	15.18	1742.05	2055.61
2	Chaparral	400.00	14.96	16.11	1602.74	1891.23
3	Epic	390.00	14.30	15.45	1574.97	1858.46
4	15977	365.00	15.53	16.68	1452.56	1714.03
5	161168	350.00	15.84	16.99	1387.69	1637.47
6	181016	330.00	13.18	14.33	1350.32	1593.37
7	Spire	335.00	19.19	20.34	1274.61	1504.04
8	Montcalm	320.00	15.59	16.74	1272.56	1501.62
9	161164	300.00	15.47	16.62	1194.75	1409.80
10	Seattle	270.00	14.70	15.85	1085.20	1280.54
11	161165	245.00	12.44	13.59	1011.17	1193.18
12	Red Hawk	245.00	14.43	15.28	991.39	1169.84
13	181021	245.00	15.59	16.74	974.31	1149.68
14	161156	210.00	16.15	17.30	829.50	978.81
15	161166	205.00	15.72	16.87	813.96	960.48
16	Rampart	205.00	17.19	18.34	799.57	943.49
17	181020	75.00	17.01	18.16	293.17	345.94
					Maximum	2,055.61
					Minimum	345.94
					Average	1,363.98

Light Red Kidney Whole Sample Yields (Sorted by Yield)

	Variety	Total Weight	Moisture	Adj. Moisture	Yield	Yield Adj. by
1	Clouseau	570.00	12.55	13.73	1785.01	2106.31
2	15916	545.00	11.90	13.08	1719.58	2029.11
3	Pink Panther	550.00	13.73	14.91	1698.82	2004.61
4	161082	560.00	15.53	16.71	1693.12	1997.88
5	15923	535.00	13.73	14.91	1652.49	1949.94
6	16998	495.00	13.42	14.60	1534.51	1810.72
7	Ronnies Red	465.00	12.63	13.81	1454.84	1716.72
8	Red Dawn	445.00	13.50	14.68	1378.22	1626.30
9	11413	430.00	13.65	14.83	1329.42	1568.71
10	Big Red	390.00	14.34	15.52	1195.98	1411.26
					Maximum	2,106.31
					Minimum	1,411.26
					Average	1,822.16





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