Kernza®CAP

Year Three Annual Report

Prepared December 2023





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Cover photo by Valentin Picasso

KernzaCAP year three by the numbers



Key Market Developments

Supply and Demand Reviews

- 3,979 acres total (2022 figures, released in 2023 Supply Review)
- Average yields of 409 lbs/ac in 2021 and 288 lbs/ac in 2022
- 2023 demand review identified pricing window of \$2.00-3.00 per lb for conventional whole grain and \$1.84-\$4.00 per lb flour

New Products on the Market

- Kodiak Kernza Cakes
- Kernza beers from 11 breweries partnering with Patagonia Provisions as a part of the "A Good Grain Collaborative"
- Tattersall Distilling Kernza whiskey
- Smoky Hill Distillery Kernza whiskey
- Long Table Pancakes
- Sturdiwheat Kernza Cinnamon Pancake and Honeyed Kernza Muffin mixes
- Cascadian Farms Kernza cereal expands to Kroger and Giant stores

Market Observations

- Regenerative Organic Certified and certified organic demand and pricing remain strong
- Demand for conventional is weak and prices moderated by 40% in 2023
- New Kernza ingredients became available in 2023 including rolled and flaked Kernza
- New millers onboarded to offer more flour varieties

Key Barriers Identified and Being Addressed

- Grain grading and standards project designed and seeking funding
- Life Cycle Analysis initiated
- Transparency dashboard for supply being developed
- Part-time sales rep on-boarded to address market stagnation for conventional grain; on contract to help test marketing materials at The Land Institute
- Overshoot on pricing, inconsistent grain quality, and limited ingredient availability created a modest surplus, especially of conventional grain, in 2023

Project Overview

One of humanity's most urgent challenges is to provide food, feed, and fiber for a global population of 10 billion by 2050. This challenge is compounded by the fact that the world's current annual-based cropping systems are damaging the natural resource base necessary for agricultural productivity. In contrast, perennial crops can improve agricultural sustainability because their extensive root systems reduce soil erosion, nutrient runoff, and pesticide requirements, while potentially increasing farmer incomes through decreased annual inputs and costs. The domestication of the world's first commercial-scale perennial grain crop (intermediate wheatgrass) is underway in the US, trade named "Kernza®". This project is leveraging and expanding a strong network of researchers, educators, farmers, businesses, non-profit leaders, and others to launch a perennial grain crop enterprise based on Kernza.

KernzaCAP was funded by the U.S. Department of Agriculture National Institute of Food and Agriculture (USDA NIFA) in 2020 and runs through August 2025. This project currently supports over 90 researchers, graduate students, business leaders, nonprofit professionals, and farmers across nine states (Appendix A). Collaborators are organized into six objective teams:

- 1. Advance germplasm & trait evaluation
- 2. Enhance agronomic & on-farm knowledge
- 3. Improve environmental quality
- 4. Engage education, extension, & policy
- 5. Develop supply chains & economic drivers
- 6. Intentional integration

Collectively, KernzaCAP aims to activate transformational change in agriculture that improves the environment and rural prosperity. Outcomes will include Kernza variety candidates for various regions of the



United States; agronomic recommendations for optimizing yield, profitability, and environmental quality; expanded acreage in ecologically sensitive areas to protect drinking water from nitrate contamination; new Kernza supply chains and products; and an education and extension portfolio of tools and events to educate a broad range of students, agriculture professionals, and the public.

This report summarizes activities and outcomes from year three of KernzaCAP (September 2022 through September 2023).

Project Organization & Management

In year three of the project, the management team continued to meet weekly to ensure smooth grant operations and project execution. The Coordinating Team, made up of the project management team and co-leads of each objective team (Figure 1), met bi-weekly to encourage integration across teams and provide high-level thinking and decision making for the project.

"It's so exciting to see our community grow and thrive. We have learned a tremendous amount together and we are entering a phase of the second half of this project to bring those learnings to fruition for an even broader community "

-Environmental Quality Objective Team Lead Dr. Jessica Gutknecht

The 17-person Advisory Committee (Appendix A) is made up of individuals from 9 states and 3 countries. The Advisory Committee convened in February 2023 to provide feedback and reflect on the first half of the project. Advisory Committee members were also invited to the annual all-hands meeting, Kernza Conference, and the KernzaCAP monthly lunchtime seminar series.



Figure 1: Project organization chart

The second annual all-hands meeting was hosted on October 24, 2022 with over 60 collaborators participating virtually (Appendix B). The third all-hands meeting was hosted in conjunction with the annual Kernza Conference on June 21, 2023 with 70 collaborators participating in-person (Appendix C). The all-hands meetings provide an opportunity for conversation, reflection, and updates across objective teams, which is critical to meet our integration goals.

The 2023 Kernza Conference was hosted June 22-23 in Minneapolis, Minnesota by Forever Green, Green Lands Blue Waters, and KernzaCAP. While not a KernzaCAP activity directly, it was planned by project collaborators and heavily featured KernzaCAP research, and many KernzaCAP collaborators attended. The conference included 120 attendees from every major discipline of Kernza-related work and helped disseminate recent research findings and share commercialization updates.



Kernza Con attendees visit Perennial Pantry, University of Minnesota research fields, and Kimber Contours Farm. Photo credits: Aaron Reser and Laura van der Pol

The data management subgroup continued to set up systems for data collection and analysis. The subgroup created protocols and templates for all field collection activities and distributed them to research sites to promote consistent data collection. A data collection and use protocol was created to outline steps for data entry, quality control, and use. This will help ensure the highest quality project data and fair use by all collaborators.

Collaborators continued to use the reporting system designed at the beginning of the grant to track progress and outcomes across objective teams. All collaborators have access to a project CV and are responsible for adding their work to the CV on a regular basis. Annually, subaward institutions and objective team co-leads fill out a report that the project manager compiles and submits to USDA. Annual reporting also includes budget checks with objective teams and subaward institutions to ensure spending remains on track.

Project collaborators have access to a private Google Site with quick links to important documents and a project calendar. This internal site also links to the project's Google Drive, which hosts all project documents and objective team folders and allows team members to easily upload, share, and review documents.

To communicate with external stakeholders interested in the project, KernzaCAP sends a quarterly newsletter through MailChimp that had an audience of 210 at the end of year three. This newsletter provides project updates, collaborator introductions, and media stories highlighting Kernza. Newsletters are archived online and can be accessed on the project website (www.kernza.org/kernzacap), which is regularly updated to reflect progress.

Germplasm & Trait Evaluation

Advance intermediate wheatgrass (IWG) germplasm and trait evaluation for improving yield, economic viability, and ecosystem services as a perennial grain crop.

Team members

- Dr. James Anderson (co-lead) University of Minnesota
- Dr. George Annor (co-lead) University of Minnesota
- Dr. Prabin Bajgain (co-lead) University of Minnesota
- Dr. Lee DeHaan (co-lead) The Land Institute
- Obed Aduama University of Minnesota
- Dr. Jared Crain Kansas State University
- Dr. Pam Ismail University of Minnesota
- Coleman Selfridge University of Minnesota

Team objectives

Objective 1: Improve IWG breeding populations and release varieties adapted to specific regions of the United States.

The University of Minnesota Kernza breeding program collected phenotypic data on the Cycle 6 breeding population at two Minnesota locations, St. Paul and Lamberton, during summer 2023. Based on the data collected, four new crossing blocks will be established in spring 2024 to begin the development of new candidate varieties. The new breeding population, Cycle 7, was selected using genomic prediction models and established in St. Paul and Lamberton during August-September 2023. The Cycle 7 population comprises approximately 1200 plants, a 20% increase in population size relative to Cycle 6 and a nearly 100% increase relative to Cycle 5. The University of Minnesota team also harvested variety trial plots at St. Paul and Lamberton. Samples were cleaned and weighed from October-December 2023 to obtain performance data.



Kernza variety trials in Lamberton, MN, August 2023. Photo credit: Prabin Bajgain

The team will continue to evaluate the Cycle 6 population in 2024 for important traits such as grain yield, seed size, shatter resistance, free threshing, plant height, and disease resistance. Cycle 7 will be evaluated in 2024 and 2025 and best individuals will be selected as parents of new synthetic cultivars. Data from current and new variety trials are expected to aid in selection of the new Kernza cultivar to be released by the University of Minnesota.

Objective 2: Develop a low cost genotyping approach that leverages recently completed IWG genome sequencing to genotype larger breeding populations.

The team updated computational methods to analyze larger datasets: instead of using several thousand DNA markers, they can now analyze millions of markers without over-burdening available resources. They utilized data generated by low-pass sequencing (also called skim sequencing) from Kernza CAP and other projects to compile over 6,000 intermediate wheatgrass genets that have been genotyped with both older (genotyping-by-sequencing) and newer skim sequencing methods. The current pipeline can go from sequence data to imputed SNPs for thousands of individuals in approximately seven days, using STITCH software for data imputation, which has a large and strong body of literature supporting its standing as a top of the line product. The current focus has been on how to adequately use these millions of markers, as it appears that some markers are imputed (inferred) inconsistently. The solution appears to be appropriate filtering, and current work has shown that large differences in genomic selection accuracy can be achieved through filtering. Future work includes identifying appropriate filters and incorporating skim-sequencing into the breeding pipeline.

Objective 3: Expand database of genotyped plants and associated phenotypes to improve accuracy of genomic selection models and increase breeding efficiency.

The University of Minnesota Kernza breeding program deposited genotypic and phenotypic data to the Kansas State University database from Cycles 1 and 2 in April 2019 and Cycles 3 and 4 in October 2021. Cycle 5 and Year 1 of Cycle 6 data will be deposited beginning in late 2023.

In addition, The Land Institute has historic data from Cycle 5 (prior to 2015) to the present cycle in 2022, which will be a valuable resource for developing genomic selection methods because it includes information on both physical characteristics of plants and their genetic makeup. Genomic selection models are currently being trained and evaluated for both University of Minnesota and The Land Institute breeding programs, and have been applied to select superior genotypes in the University of Minnesota Kernza breeding germplasm.

Objective 4: Evaluate breeding germplasm for the nutritional quality and storage stability of IWG ingredients and food products.

The team analyzed nutritional characteristics of whole and refined Kernza grown in Minnesota and Wisconsin. Kernza fertilized with 80 lbs/acre of nitrogen in Fall or Spring was analyzed for proximate composition, gluten aggregation kinetics, dough mixing properties cooked past profile, total starch, and starch damage. N application in either season resulted in increased protein content, but the increase was larger for Spring-fertilized samples from both locations. Refined flour protein content was 20.5% in the control, compared to 21.9% in Spring-fertilized and 21.1% in Fall-fertilized Kernza in Minnesota. Values of 21.1%, 22.9% and 21.1% protein were reported for control, spring-fertilized and fall fertilized samples in Wisconsin.



Graduate student Obed Aduama conducts food science research at the University of Minnesota in 2023. Photo credit: George Annor

Technical information on Kernza's functional properties is important for manufacturers who are interested in using the grain in processed food products. The food science researchers at the University of Minnesota conducted a variety of tests to provide this data. Nitrogen treatment decreased the maximum viscosity (MV), a measure of the highest viscosity obtained from a slurry of the samples when cooked to 95°C, for refined and whole grain flour at both locations. In refined flour, MV was 335.5 BU in the control, 246 BU in Spring-fertilized Kernza, and 296 BU Fall-fertilized Kernza. For whole grain flour, MV was 257 BU in the control, 190.5 BU in Spring-fertilized Kernza and 198 BU in Fall-fertilized Kernza. The decrease was greater in

Spring than Fall at both locations, indicating that nitrogen treatment increased the protein content at the expense of carbohydrate. Nitrogen fertilization decreased setback, a measure of the increase in the viscosity of a cooked slurry of the samples when cooled to 50°C. Setback was 397 BU in the control and 268 and 286 BU in Spring- and Fall-fertilized Kernza, respectively. The decrease was greater in Spring than Fall in both refined and whole grain flour at both locations. Nitrogen fertilization did not affect the onset temperature of gelatinization, but did impact the dough mixing properties of the samples. Generally, the effect of nitrogen treatment on the pasting properties of Kernza was more pronounced in Wisconsin than Minnesota.

In the coming year, the team will analyze grain harvested from Agronomy and Environmental Quality objective team trial plots at several locations to collect additional data on nutritional quality and storage stability of Kernza ingredients and food products.

Objective 5: Explore the impact of breeding on root architecture and subsequent effects on ecosystem services.

Mini-rhizotrons were used to take root images of the UMN Cycle 6 IWG breeding population at four soil depths in St. Paul during May-November. During October and November 2023, the images were processed using RootPainter, a machine-learning software, to obtain preliminary results and identify roots from the soil and other non-root mass present in the soil. The processed images will then be analyzed using a feature-extraction program to obtain root properties.



Mini-rhizotron experiment in the University of Minnesota's Cycle 6 IWG selection nursery in St. Paul, MN, August 2023. **Panel A** shows a mini-rhizotron tube next to a Kernza plant; **Panels B** and **C** are example root images captured by the mini-rhizotron camera. Photo credit: Prabin Bajgain, Alex Griffin

Agronomy & On-Farm Knowledge

Enhance agronomic and on-farm knowledge of IWG grain production systems.

Team members

- Dr. Valentin Picasso (co-lead) University of Wisconsin, Madison
- Dr. Nicole Tautges (co-lead) Michael Fields Agricultural Institute
- Dr. Andrea Basche University of Nebraska, Lincoln
- Dr. Steve Culman The Ohio State University
- Dr. Julie Dawson University of Wisconsin, Madison
- Dr. Leonardo Deiss The Ohio State University
- Madeline DuBois The Land Institute
- Carmen Fernholz A-Frame Farm
- Dr. Jake Jungers University of Minnesota
- Dr. Audrey Kalil North Dakota State University
- Dr. Priscila Pinto University of Wisconsin, Madison
- Dorothy and John Priske Fountain Prairie Farm
- Roberta Rebesquini University of Nebraska-Lincoln
- Ben Robinson The Ohio State University
- Mercedes Santiago The Land Institute
- Dr. Dave Stoltenberg University of Wisconsin, Madison
- Dr. Laura Van der Pol The Land Institute

On-farm partners

- Whilden Hughes W. Hughes Farms, Wisconsin
- Dustin Johnsrud Johnsrud Farms, North Dakota
- Kurt Kimber Kimber Farms, Minnesota

Team objectives

Objective 1: Evaluate variety candidates and their response to growing conditions and agronomic practices across the United States.

The team carried out the second year of the Genotype by Environment by Management (GEM) trial. The GEM trial explores how genotypes perform in different environments under a range of management strategies (Figure 2), evaluating how row spacing (12 or 24 inches) and legume intercropping (red clover or alfalfa) affect growth, yield, and yield longevity in four breeding lines that are top candidates for variety release later in the project: two lines with higher seed size, one line with improved threshability, and one line with high rhizome production. These four

breeding lines are being compared to the industry standard variety at each site (MN-Clearwater or TLI-C5). The trial was initially established at six collaborating institution research sites in Wisconsin, Minnesota, Kansas, Ohio, and Nebraska in September and October 2021, but the Ohio site was discontinued due to problems with establishment.



GEM Trial (Genetics x Environment x Management)

Figure 2: Diagram of the Genotype x Environment x Management experiment. Credit: Priscila Pinto

The Agronomy team has now gathered two years of grain and biomass data for 14 treatments in this trial, at six sites. Data collection began in November 2021 with stand counts to evaluate establishment and early seedling vigor. After the Summer 2022 harvest, fall forage regrowth samples were collected in October-November of 2022 in six of the fourteen treatments; biomass was dried and weighed to calculate dry matter forage yields. Weed counts and stand counts were performed again in spring 2023. Lodging, growth stage, and plant height measurements were collected throughout the growing season and prior to harvest. Grain and biomass were dried and weighed after harvest in August 2023. Remaining biomass was cleared by mowing and baling off to encourage regrowth. Data analysis and publication preparation with this data is underway.

Objective 2: Optimize nitrogen (N), phosphorus (P) and potassium (K) management for Kernza grain and forage production across US environments.

The team planned and implemented a fertility trial to study different fertilizer management practices for Kernza compared with annual cropping systems of corn and soy (Figure 3). The

experiment features 12 treatments, including nitrogen application rates, timing, and source, and phosphorus and potassium rates, replicated four times in six locations (the same locations as the GEM trial). This experiment will provide needed fertilizer recommendations for Kernza growers.

Plot size, management operations, and timing of activities were replicated as closely as possible across sites. The selected treatments allow the team to answer the following research questions:

- 1. What rate of nitrogen application (between 0 and 160 pounds of nitrogen per acre) applied in spring maximizes grain yields and minimizes nitrate loss?
- 2. What timing of nitrogen application (fall, spring, or split) maximizes yields and minimizes nitrate loss?
- 3. Is annual phosphorus and potassium application necessary to maintain high grain yields?
- 4. How do conventional and organic sources of fertility compare, in terms of ability to maximize and sustain grain yields while minimizing nitrate losses?



Figure 3: Diagram of the fertility trial. Credit: Priscila Pinto

The team established the trials at all sites in September and October of 2021, and data were collected in 2021, 2022, and 2023 for both forage and grain harvestable products. Environmental quality measurements were also conducted throughout the summer by each Agronomy site team (see EQ section). Prior to Kernza grain harvest, growth stage, lodging, and height measurements were collected. Grain and biomass were hand-sampled with quadrats from each plot, then dried and weighed before grain heads were threshed. The grain was cleaned of foreign matter, then weighed to calculated yields. Plots were cleared off with plot combines at each site.

In September and October of 2022, corn and soybean control treatments were hand-sampled with quadrats; grain and stover were dried and weighed to calculate yield. All grain harvested in the trial (Kernza, corn, and soybean) was analyzed for nitrogen content to estimate plant nitrogen availability). Selected treatments of Kernza were analyzed for harvest biomass forage quality by the University of Wisconsin team. Fertilizer treatments were applied in fall of 2022 and spring of 2023 (depending on treatment timing). Weeds were controlled via herbicide application at all sites to maintain Kernza stand health. Crop growth stage and crop and weed cover visual ratings were conducted in spring 2023, prior to herbicide application. Corn, soybean, and sorghum control treatments were planted in May 2023. Persistent drought conditions throughout the Midwest negatively affected biomass production and crop vigor at most sites in 2023. Nonetheless, the trial was successfully harvested for the second year in 2023.

Initial analysis demonstrated the importance of the cumulative precipitation in the two months before flowering (anthesis) in predicting yield outcomes. This work will help understand Kernza's suitability as a crop in other regions as well as potentially provide a tool that farmers could use to decide whether to harvest grain or forage in a given year.



Left, Tomas Cassani, The Land Institute, visits Priscila Pinto and Korede Olugbenle, University of Wisconsin-Madison, in November 2022. Photo credit: Tomas Cassani Right, the University of Wisconsin team harvests research plots. Photo credit: Valentin Picasso

For both trials in objectives 1 and 2 (GEM and fertility), researchers at all sites contributed to protocols to encourage uniformity across sites. Management operations and records were documented online in the project's shared cloud storage. Data entry and backup is ongoing, and data collection will continue in following years.

Objective 3: Conduct participatory on-farm research to leverage grower experience and knowledge to inform research strategies and address regionally specific management practices to support the grower's network.

On-farm trials are active on three farms. Yield and biomass data were collected from these farms, and one round of soil sampling was conducted with similar analysis to the fertilization trials. Several field days were held to communicate results:

- Organic Cereals Field Day, West Madison Ag Research Station, Wisconsin, May 2023
- Kernza Field Day, A-Frame Farm, Madison, Minnesota, July 2023
- VIKING and SITES Project Field Days, Alnarp, Sweden, July 2023
- Mariedal Farm Field Day, Sweden, July 2023
- Natural Resources Foundation Field Day, Walworth County, Wisconsin, August 2023
- Michael Fields Agricultural Institute Field Day, East Troy, Wisconsin, August 2023

In the coming year, data collection will continue in all experiments, along with data analyses and publications of extension reports.



Harvest at the University of Wisconsin research plots. Photo credit: Priscila Pinto

Environmental Quality

Measure the environmental outcomes and benefits of IWG production systems for strategic deployment across the US.

Team members

- Dr. Jessica Gutknecht (co-lead) University of Minnesota
- Alyssa Hartman (co-lead) Artisan Grain Collaborative
- Dr. Nathaniel Brunsell University of Kansas
- Dr. Tomás Cassani The Land Institute
- Dr. Tim Crews The Land Institute
- Dr. Laura Van der Pol The Land Institute
- Soudeh Ghasemian University of Kansas
- Wonsook Ha United States Geological Survey
- Gurparteet Singh University of Minnesota
- Jared Trost United States Geological Survey

Team objectives

Objective 1: Quantify the potential of Kernza to improve water quality through a combination of field measurements and modeling on plot and landscape scales.

The team gathered a second year of lysimeter and soil moisture data, and analysis is underway. Integrating and analyzing soil moisture data from all six sites has been challenging as each has a slightly different process and naming scheme. Singh and Jungers have been improving data import processes, and the team is exploring ways to support all collaborators in collecting and uploading data. The MFAI and UNL sites were not able to collect lysimeter samples for soil water nitrate analysis this year due to equipment malfunction, lack of resources, or a combination of factors. The other four sites had varying degrees of limitation due to a second year of severe drought in the Upper Midwest in May and June. In late September a lysimeter rewetting protocol was tested at the University of Minnesota so that researchers can more quickly begin to collect samples again after drought in future years. Progress is being made on automated water runoff cameras (the cheese-cam) and the team hopes to deploy them at some sites in 2024.

Scoping and planning has progressed this year for the water quality monitoring work. The modeling team (Singh, Jungers, Trost, and Ha) have held weekly meetings since July. The team plans to do initial simulations and optimization for Kernza in the Root Zone Water Quality Model (RZWQM), sharing data with UMN researcher David Mulla, who had already created a DSSAT Kernza crop parameter file to be used with the RZWQM model. In addition, model sensitivity to local site conditions is being explored at the UMN site, to position this work to

incorporate data from all six CAP field sites. The goal for fall 2023 is to perform initial runs of this model. Within the next year, initial model validation is expected to be performed for Kernza using Minnesota data, and the first two years of water quality data will be analyzed.

Objective 2: Quantify the potential of Kernza to reduce GHG emissions by reviewing field observation data and by improving models to include parameters specific to Kernza.

Parameterization and verification of the NOAH-MP land surface model for Kernza continues, using eddy covariance tower data from The Land Institute location and Kernza phenological parameters. The parameterization process will continue next year, and sensitivity scenarios will be performed to assess the viability of Kernza to different geographic and climatic factors such as drought and increased temperatures across the KernzaCAP sites and other areas of interest.



Gas flux monitoring at the University of Minnesota. Photo credit: Laura Van der Pol

Objective 3: Quantify soil health changes under Kernza cropping systems, including soil physical characteristics, as potential drivers of other ecosystem services.

Data processing, quality control, and entry into the soil master data sheet are underway for 2021 baseline data and 2022 and 2023 treatment response data. The team gathered a second year of soil health samples in June of 2023 at the FERT trial and a second year of N mineralization data at the FERT and GEM trials, using the same protocols as 2022. In August and September 2023, the team carried out soil water infiltration measurements, using a <u>method</u> optimized at The Land Institute, in three FERT treatments: conventional soybean, 160 lbs/ac N in fall as manure N, and 160 lbs/ac N in spring. Data are now being entered and processed.

The EQ team is finalizing a manuscript to report Year 1 climate, soil characteristic, and yield data that will also serve to describe the methods of the FERT experiment. Final analysis and editing will be completed prior to publication in the coming year. Over the next year the team will also analyze and integrate the first two years of soil health data into the soil master datasheet and carry out the third and final year of field data collection.



Infiltration rate data gathering at The Land Institute. Photo credit: Tomas Cassani

Education, Extension, & Policy

Engage education, extension, and policy to deploy Kernza production and support perennial crops.

Team members - Year Three Activities

- Erin Meier (co-lead) Green Lands Blue Waters
- Dr. Aubrey Streit Krug (co-lead) The Land Institute
- Dr. Cynthia Bartel C. Bartel Inc.
- Dr. Michael Bell University of Wisconsin, Madison
- Maura Curry Land Stewardship Project
- Dr. Clair Keene North Dakota State University
- Jonathan Kilpatrick Sustainable Farming Association of Minnesota
- Dr. Diane Mayerfeld University of Wisconsin, Madison
- Sienna Nesser University of Minnesota Forever Green Initiative
- Lydia Nicholson The Land Institute
- Hannah Stoll University of Minnesota
- Lucinda Winter Sustainable Farming Association of Minnesota

Team objectives

Objective 1: Develop, deploy, and distribute modular educational curricula targeted at students and teachers from middle school through graduate level education.

The EEP team drafted 16 new educational lessons for a total of nearly 30 lessons on a range of topics that align with high school standards in subject areas including science, history, and English. Lessons continue to be disseminated via monthly newsletters to 79 network members for review and beta-testing. The team also collaborated with UW-Madison agroecology educators to evaluate draft lessons and the framework in preparation for moving into the last phase of lesson development, revision, and publication. Finally, the team collaborated with colleagues at The Land Institute to host 300+ students from 14 area schools for field trips featuring hands-on activities, which helped test lesson activities. Lesson testing was also carried out at a nearby youth event in Kansas engaging about 200 students. The team was also able to test two lessons in class at a Kansas high school, engaging around 68 students.

Throughout the remainder of the project, the team will:

- Grow and support the network of teachers who use educational lessons, including by engaging with relevant organizations of high school teachers of agriculture, environmental education, and science
- Collaboratively evaluate, revise, and finalize lessons

• Decide curriculum publication format, create and implement a public launch and dissemination plan, and publish Kernza in Context so that it is freely available!

Objective 2: Develop Extension capacity and technical assistance for farmers.

This team continues to coordinate the extension cohort. One particular success for the Extension cohort work was the transition of original cohort member Ryan Buetow from NDSU to a State Agronomist position with Minnesota NRCS, where he became a "Kernza lead." He attended KernzaCon representing Minnesota NRCS, and now is an active part of the team working on the potential adoption of Practice Standard 328, Conservation Crop Rotation, in EQIP in Minnesota. Minnesota is developing a regional payment scenario for the Great Lakes States (Minnesota, Wisconsin, and Michigan) that could be adopted by other regions as well. The team has a positive, open and engaged relationship with Ryan regarding this work and we imagine future inclusion of Kernza in other NRCS practices.

Extension Cohort virtual meetings were hosted year-round except for summer, so cohort members could attend, participate in, and host field days. Meeting dates and topics included:

- September 29, 2022 Feedback on field day experiences; What worked or didn't, gaps, who are the experts they want to talk with and learn from to answer questions?
- October 27, 2022 Viewed the recorded March 2022 Kernza CAP seminar on Agronomy updates and discussed
- November 22, 2022 Attended the Kernza CAP seminar on policy activities
- December 2022 Read and viewed resources compiled in a shared resource folder
- January 10, 2023 Hosted a discussion about self-directed learning and what you want to learn over the next year
- February 14, 2023 Learned about and discussed Kernza supply chain, markets and MN EECO program; presenters included Colin Cureton and Sienna Nesser of Forever Green
- March 14, 2023 Learned about and discussed Kernza as a dual use (forage and grazing) crop from Dr. Steve Culman
- April 11, 2023 Reviewed, commented on and discussed the new Kernza Growers Guide with co-author, Dr. Nicole Tautges
- June 2023 Encouraged cohort to attend KernzaCon (June 22-23) in Minneapolis
- Summer 2023 Encouraged cohort members to attend, participate in, and host field days. Kernza-related field days hosted or co-organized by cohort members included:
 - Naeem Kalwar, NDSU Extension Soil Health Specialist field day and plot tours at the NDSU Langdon Research Extension Center on June 27, 2023
 - Colleen Carlson, UMN Extension and Small Farms Team specialty grains event on March 21, 2023
 - Steffen Mirsky, WI Extension Emerging Crops Specialist Organic grains field day featured Kernza plots at the West Madison Research Station on May 24, 2023

Going forward, the team plans to identify what is most needed now by Extension staff in the face of market challenges, such as in-person versus virtual or video educational opportunities and the design of a toolkit focused on processing and marketing to use as a resource and outreach tool.



Nicole Tautges presents at the Michael Fields Agricultural Institute Field Day in East Troy, Wisconsin, August 2022. Photo Credit: Erin Meier

Objective 3: Develop a Kernza Grower-Researcher Network focused on current Kernza growers linked with established markets.

The primary way that growers and researchers connected in 2023 was through field days, which offer opportunities to strengthen relationships among growers, researchers, extension staff, and other technical assistance providers. Collaborators attended 25 field days hosted by various organizations. The following events were organized by and/or featured KernzaCAP collaborators:

- December 15, 2022, St. Cloud, MN UMN Extension Soil Management Summit; Dr. Jacob Jungers presented, "Agronomics for profitable and sustainable Kernza production"
- March 30, 2023, Minneapolis Sustainable Farming Association co-hosted a Kernza Taste & Tour with the Twin Cities Metro Growers Network at Finnegans Brew Co. in Minneapolis, featuring their new Buckwheat Honey Brown Kernza Ale. David McNicoll

of Finnegans and UMN staff led a tour; Mike Mackiewicz of Bone Lake Meadows Apiary talked about the featured local ingredients, Kernza and buckwheat honey

- June 13, 2023, Zoom Forever Green Zoom Grower call on Kernza with Dr. Jacob Jungers, Dr. Prabin Bajgain, and farmer Jay Peterson from Blooming Prairie, MN (<u>Recording: https://www.youtube.com/watch?v=Tf75cleEzK0</u>)
- July 12, 2023, Williston, ND The Williston Research Extension Center Annual Field Day, organized by Dr. Clair Keene who presented on Kernza, joined by Drs. Lindsay Malone and Kelsey Grisham, new NDSU soil scientists.
- July 14, 2023, Morris, MN Sustainable Farming Association and UMN West Central Research and Outreach Center hosted a field day focused on Kernza grazing
- August 9, East Troy, WI Michael Fields Agricultural Institute hosted a field day featuring the Institute's production field of third-year Kernza interplanted with clovers, as well as alternative crops for grain rotations, including hemp, millet, and dry beans
- August 16, Epping, ND Dr. Clair Keene helped co-host an informal field walk at the Dustin Johnsrud farm to discuss the ~30 acres of Kernza he planted in May 2021

The team has now fully met the project obligation of directly organizing at least 10 field days and educational events targeting producers. To better reach new growers in an ongoing way, Land Stewardship Project will shift its contract work from hosting field days and educational events to creating a series of short, accessible, producer-targeted videos on Kernza production, harvest and post harvest processing.

Objective 4: Raise awareness and deepen understanding about the transformative power of perennials with public decision makers.

Work complete before this reporting period.

Objective 5: Construct a national framework for Kernza adoption opportunities through state and federal conservation programs.

The team developed program points of entry in the Farm Bill framework to support and legitimize Kernza as a perennial grain crop, collaborating with the USDA Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), and Risk Management Agency (RMA).

Program support achieved specifically to encourage and de-risk farmer adoption include:

- 1. FSA crop certification for Kernza grain and forage
- 2. NRCS working lands incentives through the Conservation Stewardship Program (CSP) Perennial grain crop conservation rotation (E328O), and developing framework for farmer data sharing to evaluate RMA crop insurance products. Identified key response

metrics for crop insurance product development and consideration by RMA to de-risk farmer adoption.

Throughout the remainder of the project, the team will:

- Work to achieve farmer data collection for RMA that addresses evaluation needs for potential crop insurance products
- Continue to educate and encourage farmers to apply for Conservation Crop Rotation cost share benefits and work with and support NRCS staff in the Great Lake States around the inclusion of perennial grains in this standard under both CSP and EQIP (in September 2023, we learned of EQIP inclusion in Minnesota)
- Help to design and deliver a MN NRCS and Board of Soil and Water Resources (BWSR) Tech Talk on Kernza that will be recorded and available to hundreds of state and federal conservation professionals (invited September 2023)



Dr. Jake Jungers gives a tour of the University of Minnesota St. Paul Kernza plots in June 2023. Photo credit: Laura Van der Pol

Supply Chains & Economics

Develop supply chains and economic drivers for Kernza.

Team members

- Colin Cureton (co-lead) Forever Green Initiative, University of Minnesota
- Dr. Tessa Peters (co-lead) The Land Institute
- Christopher Abbott Perennial Pantry
- Alicia Baddorf University of California, Davis
- Christie Biddle Patagonia Provisions
- Gwenael Engelskirchen University of California, Davis
- Tannie Eshenaur Minnesota Department of Health
- Hana Fancher The Land Institute
- Alex Heilman Perennial Promise Growers Cooperative
- Dr. Nicholas Jordan Forever Green Initiative, University of Minnesota
- Andrew Leach University of Minnesota Forever Green Initiative
- Peter Miller Sustain-a-Grain
- Ben Penner Penner Farms

Team objectives

Objective 1: Develop a Kernza Business Association to be the voice for Kernza industry partners in a broader Kernza Consortium.

Following development of a strategic plan for a Kernza Stewards Alliance, objective one has been primarily on 'hold.' The determined business structure requires that we secure additional funds to incorporate a perpetual purpose trust, but USDA funds cannot be used for this work. Additionally, the foundational research in Objective 2 has shown that promotion of the grain is the most important work for the coming years. A decision not to reallocate funds was made. In the coming year, the team will reconvene stakeholders for project and market updates.

Objective 2: Perform foundational consumer research and market analysis to determine Kernza's profitability for producers, supply chain actors, and end-users.

The first Kernza Demand Review was conducted, providing valuable information on pricing as well as next steps that influence the work in Objective 4. In the following year, the team plans to conduct a demand review with in-depth interviews in California and broader audiences, and distribute national consumer surveys to garner 1,000 target consumer perspectives and 300 potential buyer perspectives on perceptions and preferences of Kernza and similar projects.

Objective 3: Research, develop, and solidify Kernza supply chains and markets.

The team completed many activities to support this objective, including averting a seed shortage in 2022, securing over 10,000 pounds of Kernza for additional processing research with Perennial Pantry, redistributing 20,000 pounds of Kernza grain to build a price sensitivity experiment, joining monthly PPGC co-op marketing meetings, developing a pilot marketing campaign working group for low-inclusion, high demand products, and releasing five new limited varieties through Sustain-a-Grain.

The team also developed and passed a Minnesota State pilot CLC value chain development program supported by a \$0.5 million allocation, with at least two grants made to advance Kernza supply chains. One included core capacity funds to continue growing the Perennial Promise Growers Cooperative; a second project provided labor capacity to push a new Kernza food manufacturing facility to open.

In Year 4, the team will onboard a full time Product and Market Development Specialist at UMN Forever Green. The Market Development Specialist will bring significant and dedicated capacity to Kernza market development work in late 2023 through the end of the project. The team will also use the above mentioned consumer research as well as marketing materials development to advance market development, and will also examine ways to rebudget and invest more directly in our supply chain and market partners.



A variety of Kernza products from Perennial Pantry. Photo credit: Evelyn Reilly

Objective 4: Evaluate models for valuing and promoting the diverse environmental, social, and health benefits of Kernza.

Based on feedback from the Demand Review, work was undertaken to:

- Develop a supply dashboard
- Develop a grain monitoring network to evaluate Kernza quality
- Build consumer education tools and target market strategies
- Create industry-specific recipes

Goals for the coming year include:

- 1. Finalize supply dashboard pilot and expand to all Kernza grain growers
- 2. Conduct grain monitoring from 2023 harvest
- 3. Create three industry kits, including targeting brewing, baking, and CPG companies



2023 Kernza Con participants sample Kernza food and whiskey at the Tattersall Distilling welcome event. Photo Credit: Evelyn Reilly

Integration

Activate transformational change through intentional integration.

Team members

- Dr. Jacob Jungers (co-lead) University of Minnesota
- Aaron Reser (co-lead) Green Lands Blue Waters
- Dr. Tessa Peters (co-lead) The Land Institute
- Tara Ritter (co-lead) University of Minnesota
- Dr. Aubrey Streit Krug (co-lead) The Land Institute
- Greta Landis University of Wisconsin-Madison
- Amber Mase University of Wisconsin-Madison
- Erin Meier Green Lands Blue Waters
- Evelyn Reilly University of Minnesota
- Co-leads of all other objective teams participate on the integration team

Team objectives

Objective 1: Project-wide integration and activity tracking through the design of our objectives and engagement with our project partner network.

Much of the effective communication flow and support of the Kernza collaborator network depend on the daily activities of the KernzaCAP project manager and others who keep communication and project tools updated, regularly plan and run engaging meetings, and monitor project-wide opportunities to connect, synthesize and integrate.

Communications and project tools

The Integration Team used, updated, and promoted communications, tracking, and collaboration tools and activities including:

- Collaborator site, CV, and annual reporting forms
- Rules and tools document
- Data sharing & co-authorship policy (encouraged use of manuscript proposal form)
- Internal talking points
- Shared photo album
- Shared values and principles
- Race and equity framework (updated and referred to the work plan)
- Quarterly newsletters through MailChimp and regular communications to collaborators
- New templates and primary data sheets for institutions and project sites to enter data
- New code to collate data across research sites into one place

Meeting design and facilitation, opportunities to engage cross-team

The Integration Team hosted regular meetings to encourage project-wide integration and communications, including:

- Management team (weekly)
- Coordinating Team (bi-weekly)
- Advisory Committee meeting (February 2023)
- All-hands meeting (October 2022, June 2023)
- Integration team meeting (ad-hoc, monthly to quarterly)
- Evaluation team meeting (ad-hoc, quarterly to bi-annually)
- Shared leadership (ad-hoc, quarterly to bi-annually)
 - Included planning and reflection meetings with consultant Terra Soma, as well as with the management team and key Kernza stakeholders beyond KernzaCAP
- Objective teams (all have standing meetings except breeding and food science, which is the smallest team and all members interact regularly)

In addition, the Integration Team:

- Co-hosted the June 2023 Kernza Conference
- Participated in the SAS CAP project managers' community of practice, which helped KernzaCAP integrate with the broader community of CAPs across the country.
- Hosted monthly seminar series for collaborators to learn and engage across teams



KernzaCAP All-Hands Meeting, Minneapolis, June 2023. Photo credit: Tara Ritter

Outputs serve as inputs group-to-group

The initial project design articulated transdisciplinary intentions for outputs from one team to serve as inputs for another team. As the project advances, we are starting to see this come to fruition. The June 2023 All-hands objective team updates and the 'lightning talk' session of Kernza Con were designed to promote cross-team awareness and integration (for CAP collaborators and the wider Kernza community), including the points originally identified in the proposal (below) and beyond:

- Results from field trials inform breeding activities
- Optimizing agronomics for environmental impacts and market profitability
- Agronomic and EO information included in education and extension materials •
- Food science informing new product development

Over the next reporting year, the Integration team will proactively explore emerging opportunities and needs, potentially helping to plan a Kernza researcher gathering at 2024 tri-societies conference and exploring how to effectively transfer planning responsibilities for the 2024 Kernza Conference. The Integration team will also continue to communicate, update, and foster collaboration across KernzaCAP objective teams. Collaborators value this function, as indicated by comments from our 2023 all-hands evaluation:

- Sharing resources and networking is a strong point for Kernza.
- I appreciate the connection/integration between research teams in KernzaCAP within the *U* of *M*, especially. There are a lot of opportunities to share research updates throughout the year that are valuable to my own work.
- Big fan of the communication being done between groups across the Midwest.



KernzaCon attendees shared what they love about Kernza work. Photo credit: Aaron Reser

Objective 2: Co-create and actualize a Kernza Consortium to serve as a multi-stakeholder leadership body.

Work on the Kernza Consortium objective was put on hold in years one and two to allow the Kernza 'business association' to take shape in the SC&E team. The SC&E team made progress on the Kernza Stewards Alliance (KSA) and will continue this work, but it is currently paused to focus on strengthening the Kernza market.

The draft planning for the KSA has clear paths of engagement for Kernza licensees, but not for non-licensees. In Year 3, the team began exploring ways for non-licensees to engage in the KSA and in Kernza leadership more broadly through the Kernza Consortium discussions originally planned in the grant. The team contracted Terra Soma to lead a series of focus groups to assess the role of a Kernza Consortium and to begin planning an initial convening in Year 4. Those focus groups yielded an initial synthesis memo.

The team continues to follow other developing hubs of Kernza leadership, including Perennial Promise Growers Cooperative, Sustain-a-Grain, and Perennial Pantry. It also regularly engages with leadership entities and networks focused on Kernza and other perennial crops, such as the Forever Green Partnership, the UW Madison Emerging Crops Accelerator and The Land Institute's international initiative (formerly New Roots International). These groups will have an important role to play in any shared leadership entity that develops through CAP or otherwise.

The Integration team will remain engaged in KSA development and will convene other key leadership entities in the Kernza world to define roles and relationships as they relate to consortium-type activities, including Forever Green, The Land Institute, Green Lands Blue Waters, the Perennial Promise Growers Coop, Sustain-a-Grain, and others. Finally, the team will continue to explore the future landscape of Kernza funding with key leaders.

Green Lands Blue Waters and KernzaCAP staff during the Perennial Pantry tour at 2023 Kernza Con. Photo credit: Aaron Reser

Objective 3: Lead the way for the next generation of perennial cropping systems.

A key part of KernzaCAP is not only to advance Kernza, but to capture knowledge in a way that can be shared with people and projects working on other perennial crops. This will promote efficient use of resources, and synthesis, rather than duplication, of efforts. It is also the hope, given the pressing need for agroecosystems that provide ecosystem services, that sharing learnings will support more rapid development of other perennial crops. As one KernzaCAP collaborator noted, "Kernza is not the goal." Rather, the goal is transforming agricultural systems more broadly. Over the last year, the Integration Team intentionally focused on capturing and compiling reflections from KernzaCAP collaborators through the following activities:

- Start Stop Continue activity at All-Hands Meeting
 - This in-person, world-cafe-style activity was co-designed by the integration team and UW evaluation specialists to gather perspectives on what's working well in KernzaCAP and Kernza work more broadly and what could be changed (or stopped), and to collaboratively discuss ongoing and future priorities. Responses from this exercise were also incorporated into products relating to future perennial crops (see below).
- Compiled lessons learned document
 - The team compiled information that relates to Kernza as a model for future perennial crops from over 15 different sources. Information has been grouped into 'lessons learned,' which will serve as the foundation for a published document.
 - Gathering this information was a significant focus of objective team staff time during the past year. Activities included 22 interviews conducted by Evelyn Reilly as part of developing the Kernza timeline, and extensive internet searches of public press articles, peer-reviewed publications, State of Minnesota legislative records, and web pages of universities, businesses, and non-profit organizations
- Concept paper development
 - The team conceptualized and wrote a concept paper that aims to explain the motivation for developing Kernza as a perennial grain crop and the major areas of work that made it possible, including breeding, agronomic research, food science, processing and commercialization. The paper was submitted in January 2023.

In the next reporting year, the Integration team will begin drafting the lessons learned product. The team will also capture and synthesize written reflections through annual reporting and from all-collaborator input at all-hands meetings, continue to add products to the Digital Conservancy to inform future Kernza and other perennial crop partners, publish the concept paper, and revisit the KernzaCAP publication roadmap to understand and strategize across publications planned for the grant as a whole. The team will continue Race and Equity subgroup meetings and work on integrating Diversity, Equity and Inclusion (DEI) into grant outcomes and project work.

Objective 4: Catalyze new network reach and effectiveness through accessible data and shared learnings.

The Integration Team established a <u>KernzaCAP Collection</u> in the University of Minnesota Digital Conservancy. The Collection provides a permanent digital location for public-facing outputs of the KernzaCAP project, including annual reports, the 2023 Grower Guide, and the two timelines developed over the past year. Datasets deposited into the University of Minnesota's Digital Repository can be cross-linked to the collection, thus providing an integrated digital space for both data and written products that ensures their accessibility. The Collection serves an important purpose of providing a way to broadly share knowledge with other teams working on perennial crops.

In the past year significant progress was also made on the project's data management systems, including the following achievements:

- Set up data collecting infrastructure for all sites and primary data sheets to collate data across all sites.
- Wrote code to collate data across all sites.
- Created a data collection and use protocol including rules for data usage.
- Created a Quality Assurance and Quality Control error report form to ensure that all data analysts are using the most up-to-date data.
- Created a data download form to track who is using what data, and to enable us to alert relevant people to any changes in data sets.
- Encouraged use of the manuscript proposal form and received five submissions

The Integration Team also used the collaborator website, Kernza.org, newsletters (audience up to 208), and the national SAS CAP Project Managers Community of Practice to intentionally disseminate data and shared learnings and to catalyze new network reach.

In the coming year, the Integration team will continue sharing data and other learnings through current communications channels. The team will also make a plan for long-term data storage, both quantitative and qualitative, and for accessibility, storage, and dissemination of data and other project learnings. As KernzaCAP moves into the later half of the grant, the team will continue to explore ways to increase staffing capacity and other resources to support robust data collection and dissemination through the end of the grant.

Objective 5: Evaluate for impact, systems change and emergent learning.

The UW Evaluation Team and the Integration Team had two main focus areas this past year: First, analyzing and reporting on the Social Network Analysis (SNA) data. A draft report is <u>here</u>; seminar is linked <u>here</u>. The SNA data is also being used in a main figure of the concept paper. Second, taking advantage of the in-person time at Kernza Con to seek robust community feedback through the Start • Stop • Continue activity (explained above). The post-event Kernza Con evaluation included questions on KernzaCAP team functioning (summary <u>here</u>).

In the coming year, the Integration team will revisit the evaluation work plan with the University of Wisconsin Evaluation Team, and plan and assess next steps for current SNA data, including deeper explorations of SNA diagrams and characterization of the Kernza network, as well as potential future SNA data publication. Team co-leads will also meet with the Evaluation Team to consider how to achieve 'high-level' evaluation goals stated in the original proposal, such as evaluating impact, systems change, and emergent learning.

2023 Kernza Con participants visit Kimber Contours. Photo credit: Laura Van der Pol

Race and Equity Subgroup

The KernzaCAP grant aims to improve the environmental sustainability of food production and demonstrate the viability of new perennial crops as real economic opportunities for farmers and rural communities. The purpose of the race and equity work in this project is to expand perennial agriculture in a way that is fair, inclusive, and benefits all people and communities equitably. The Integration Team advanced KernzaCAP Race and Equity work in a variety of ways, including:

- Hosting the Race and Equity breakout session at the June 2023 Kernza Conference
- Held Race and Equity subgroup meetings
- Incorporated race and equity themes into several monthly seminar meetings, including:

- Amy Teller on social sustainability 0
- Jazmin Murphy on consciously communicating about perennial agriculture including how we can challenge dominant social paradigms and consider conceptions of land authority and management.
- Elisabeth Spratt, Kris Callis Duehl, Erin Meier, and Diane Mayerfeld on integrating equity into funding proposals and engaging a broader range of partners

The team will continue to identify tangible ways to continue to communicate the importance of race and equity work to all grant collaborators, explore when and how to communicate more publicly about this work, and reflect on how the outcomes of this work will be applied to create an equitable model for future perennial crops.

"The resources and structure of KernzaCAP have allowed the broad Kernza community to make connections that deepen the impact of each activity because we are all better informed by what we are learning together from research, production, outreach, and markets." _

Erin Meier

Products

Peer Reviewed Publications

- Pinto, P., Cartoni-Casamitjana, S., Cureton, C., Stevens, A., Stoltenberg, D., Zimbric, J. & Picasso, V. (2022). Intercropping legumes and intermediate wheatgrass increases forage yield, nutritive value, and profitability without reducing grain yields. *Frontiers in Sustainable Food Systems*, 6. <u>https://doi.org/10.3389/fsufs.2022.977841</u>
- Wiesner, S., Duff, A., Niemann, K., Desai, A., Crews, T., Picasso, V., Riday, H., & Stoy, P. (2022). Growing season carbon dynamics differ in intermediate wheatgrass monoculture versus biculture with red clover. *Agricultural and Forest Meteorology*, 323. <u>https://doi.org/10.1016/j.agrformet.2022.109062</u>
- Dobbratz, M., Jungers, J., Gutknecht, J. (2023). Seasonal Plant Nitrogen Use and Soil N pools in Intermediate Wheatgrass (Thinopyrum intermedium). *Agriculture*, *13*(2). <u>https://doi.org/10.3390/agriculture13020468</u>
- Vico, G., Tang, F., Brunsell, N., Crews, T., & Katul, G. (2023). Photosynthetic capacity, canopy size and rooting depth mediate response to heat and water stress of annual and perennial grain crops. *Agricultural and Forest Meteorology*, 341. <u>https://doi.org/10.1016/j.agrformet.2023.109666</u>
- DeHaan, L., Anderson, J., Bajgain, P., Basche, A., Cattani, D., Crain, J., Crews, T., David, C., Duchene, O., Gutknecht, J. and Hayes, R., Hui, F., Jungers, J., Knudsen, S., Kong, W., Larson, S., Lundquist, P., Luo, G., Miller, A., Nabukalu, P., Newell, M., Olsson, L., Palmgren, M., Paterson, A., Picasso, V., Poland, J., Sacks, E., Wang, S., Westerberg, A. (2023). Discussion: Prioritize perennial grain development for sustainable food production and environmental benefits. *Science of The Total Environment*. <u>https://doi.org/10.1016/j.scitotenv.2023.164975</u>
- Culman, S., Pinto, P., Pugliese, J., Crews, T., DeHaan, L., Jungers, J., Larsen, J., Ryan, M., Schipanski, M., Sulc, M., Wayman, S., Wiedenhoeft, M., Stoltenberg, D., & Picasso, V. (2023). Forage harvest management impacts "Kernza" intermediate wheatgrass productivity across North America. *Agronomy*, 00, 1–15. https://doi.org/10.1002/agj2.21402
- Shoenberger, E., Jungers, J., Law, E., Keene, C., DiTommaso, A., Sheaffer, C., Wyse, D., Picasso, V., & Stoltenberg, D. (accepted). Synthetic auxin herbicides do not injure intermediate wheatgrass or affect grain yield. *Weed Technology*.
- Tang, F., Crews, T., Brunsell, N., & Vico, G. (2024). Perennial intermediate wheatgrass accumulates more soil organic carbon than annual winter wheat a model assessment. *Plant and Soil 494, 509–528*. <u>https://doi.org/10.1007/s11104-023-06298-8</u>
- Cureton, C., Peters, T., Skelly, S., Carlson, C., Conway, T., Tautges, N., Reser, A., Jordan, N. (2023). Towards a practical theory for commercializing novel continuous living cover crops: A conceptual review through the lens of Kernza Perennial Grain, 2019-2022.

Front. in Sustainable Food Systems 7:1014934. https://doi.org/10.3389/fsufs.2023.1014934

Other Publications

- Bartel, C. (2022). A Step-by-Step Guide to United States Department of Agriculture Farm Program Enrollment & Incentives for Kernza. KernzaCAP extension primer. <u>https://kernza.org/wp-content/uploads/Kernza-policy-summary-11.23.22.pdf</u>
- Ritter, T. (2023). *KernzaCAP Year 2 annual report*. https://conservancy.umn.edu/handle/11299/256033
- The Land Institute (2023). 2022 Planting and Harvest Report. https://kernza.org/wp-content/uploads/2022-Kernza-Planting-Harvest-Report.pdf
- The Land Institute (2023). 2023 Kernza® Perennial Grain Market Demand Survey Findings. https://kernza.org/wp-content/uploads/2023-Kernza-Demand-Survey-Findings.pdf
- Tautges, N., Detjens, A., Jungers, J. (2023). Kernza Grower Guide. https://conservancy.umn.edu/handle/11299/255778
- Reilly, E. (2023). *Celebrating 40 years: The story of Kernza perennial grain in 40 milestones*. <u>https://conservancy.umn.edu/handle/11299/256021</u>
- Reilly, E. (2023). *Milestones in Kernza Perennial Grain Development*. <u>https://conservancy.umn.edu/handle/11299/256040</u>

Presentations

- Pinto, P., & Picasso, V. (2022, September 1). *Planting season and legume species affect grain and forage yield in Kernza intermediate wheatgrass perennial intercrops*. European Society for Agronomy meeting. Potsdam, Germany.
- Gutknecht, J. (2022, September 17). *Environmental benefits and carbon sequestration potential of Kernza perennial grain.* Presentation at Great River Greening Field Day. St. Peter, MN.
- Singh, G. (2022, September 21). *Kernza Water Quality*. The Land Institute Early Careers Researcher Workshop. Salina, KS.
- Nicholson, L. & Wineman, C. (2022, September 27). *KernzaCAP Educational Module Development*. Presentation at monthly KernzaCAP seminar. Virtual.
- Gutknecht, J. (2022, September 29). *Perennial grain systems as a pathway to improved soil functioning and climate resiliency.* Presentation to Pacific Northwest National Laboratories Environmental and Molecular Sciences Laboratory. Virtual.
- Bajgain, P. (2022, October 13). *Breeding & Domesticating of Intermediate Wheatgrass (Kernza®) for Ecological Benefits.* Presentation to University of Minnesota course ESPM 3108, Ecology of Managed Systems. St. Paul, MN.
- Picasso, V. (2022, October 24). *The perennial grains agricultural revolution*. Presentation at Bydgoscsz University. Bydgoscsz, Poland.

- Tesdell, O. & Streit Krug, A. (2022, October 24). *Biogeography of Intermediate Wheatgrass*. Presentation at monthly KernzaCAP seminar. Virtual.
- Singh, G., Gutknecht, J., & Jungers, J. (2022, November 8). Nitrate Leaching and Crop Yield for Intermediate Wheatgrass (Kernza®) in the US Midwest [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. <u>https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/146178</u>
- Jungers, J., Anderson, J. A., Bajgain, P., Cureton, C., DeHaan, L., Gutknecht, J. L., Hartman, A., Meier, E., Peters, T., Picasso, V. D., Reser, A., Ritter, T., Streit Krug, A., & Tautges, N. (2022, November 8). *Developing and Deploying Kernza, a Perennial Grain Crop* [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. <u>https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/143433</u>
- Crain, J., Larson, S., Sthapit, S., Jensen, K., Dorn, K., Poland, J., Thomas, A., & DeHaan, L. (2022, November 8). *Molecular Characterization of the Origin of the Perennial Grain Kernza* [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. <u>https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/141282</u>
- Olugbenle, O., & Picasso, V. (2022, November 8). *Does Spring and Fall Nitrogen Fertilization Affect Kernza Intermediate Wheatgrass after Five Years?* [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. <u>https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/142490</u>
- Shoenberger, E., & Picasso, V. (2022, November 8). Managing Inter-Row Spacing and Nitrogen Fertility in Dual-Use Kernza Intermediate Wheatgrass (Thinopyrum intermedium) to Sustain Grain Yield over Time [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/142654
- Bianchin Rebesquini, R., Basche, A., Picasso, V., Jungers, J., & Culman, S. (2022, November 8). *The Impact of Nitrogen Rates across Sites and Years on Intermediate Wheatgrass Grain Yields: A Meta-Analysis* [Conference presentation]. ASA, CSSA, SSSA International Annual Meeting. Baltimore, MD. <u>https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/143883</u>
- Bartel, C. (2022, November 22). *A Step-by-Step Guide to USDA Farm Program Enrollment and Incentives for Kernza*. Presentation at monthly KernzaCAP seminar. Virtual.
- Picasso, V. (2022, November 29). *Diversity and perenniality for resilience and ecosystem services in agroecosystems*. Tamm Crop Production Ecology Seminar Series. Uppsala, Sweden.
- Picasso, V. (2022, December 5). *Kernza history and KernzaCAP*. European meeting on perennial grains. Lund, Sweden.
- Jungers, J. (2022, December 15). *Agronomics for profitable and sustainable Kernza production*. UMN Extension Soil Management Summit. St. Cloud, MN.
- Cureton, C. (2023, January 5-6). Kernza Perennial Grain. Minnesota Organic

Conference. St. Cloud, MN.

- Jungers, J. (2023, January 20). *KernzaCAP Education Updates*. Minnesota Association for Agriculture Educators. St. Cloud, MN.
- Jungers, J., Pinto, P., Deiss, L., & Tautges, N. (2023, January 24). *The Future of Farming Kernza: Agronomic Research Goals of KernzaCAP*. Presentation at monthly KernzaCAP seminar. Virtual.
- Tautges, N. & Hughes, W. (2023, January 27). *Growing Kernza*. Organic Grain Resource and Information Network Conference. Madison, WI.
- Jungers, J. (2023, January 30). *Agronomics for profitable and sustainable Kernza production*. Forever Green Annual Grower Meeting. Morris, MN.
- Picasso, V. (2023, February 1). *Increasing resilience of agricultural systems with perennial crops*. International Crops Research Institute for the Semi-Arid Tropics Institutional Learning Seminar. Hyderabad, India.
- Pinto, P. & Tautges, N. (2023, February 2). *Kernza Perennial Grain*. University of Wisconsin Extension Emerging Crops Lunch & Learn Webinar. Virtual.
- Nicholson, L. (2023, February 7). *Why Perennials? Why Grains? Kernza in Context educational activity.* Kansas State University Salina Tour of The Land Institute. Salina, KS.
- Rebesquini, R. (2023, February 9). *Opportunities for the perennial grain Kernza What it is and how it is grown*. Eastern Nebraska Soil Health Conference. Mead, NE.
- Landis, G. & Mase, A. (2023, February 28). *Social Network Analysis: Understanding relationships, activities, and information flow across the KernzaCAP network.* Presentation at monthly KernzaCAP seminar. Virtual.
- Nicholson, L., & Santiago, M. (2023, March 9). *Visioning a Perennial Future, Kernza and Global Food Chains: Kernza In Context Lessons*. Presentation to Smoky Valley High School Earth Science Classes. Lindsborg, KS.
- Gutknecht J. (2023, March 21). *Tech solutions to the climate crisis*. Grand Challenge Curriculum course lecture. St. Paul, MN.
- Murphy, J. (2023, March 28). *Equitable Science Communications*. Presentation at monthly KernzaCAP seminar. Virtual.
- Nicholson, L. (2023, March 30). *Working with Perennials*. Hays High School Tour of The Land Institute. Salina, KS.
- Nicholson, L., & Streit Krug, A. (2023, March 31). *Meeting Perennials. Kernza in Context educational activity. Understanding plant relationships (intercropping).* Washington Elementary Tour of The Land Institute. Salina, KS.
- Nicholson, L. (2023, April 7). *Why Perennials? Why Grains? Kernza in Context educational activity.* Salina Central High School Tour of The Land Institute. Salina, KS.
- Jungers, J. (2023, April 13). *Sustainable agriculture in Minnesota*. Great River School class field trip to UMN St. Paul campus. St. Paul, MN.
- Nicholson, L. (2023, April 13). Working With Perennials: breeding, understanding plant

relationships. Bethel College Tour of The Land Institute. Salina, KS.

- Nicholson, L. (2023, April 13). *Working With Perennials: breeding, genotyping, threshing*. Blue Valley High School Tour of The Land Institute. Salina, KS.
- Nicholson, L. (2023, April 21) *Meeting Perennials. Kernza in Context educational activity. Understanding plant relationships (intercropping).* Kansas State University Tour of The Land Institute. Salina, KS.
- Jungers, J. (2023, April 24). *Traits and timing: sustainable management of perennial intercropping systems*. University of Minnesota Plant and Microbial Biology Graduate Program Seminar. St. Paul, MN.
- Stoll, H., Cassani, T., Rebesquini, R., & Singh, G. *KernzaCAP Student and Postdoc Presentations*. (2023, April 25). Presentation at monthly KernzaCAP seminar. Virtual.
- Brunsell, N. (2023, May 2). *Assessing the Potential Environmental Benefits of Perennial Agriculture*. Conference on Agricultural and Forest Meteorology. Minneapolis, MN.
- Nicholson, L. (2023, May 5). *What is a grain? Kernza in Context educational activity.* Presentation at MillFest. Lindsborg, KS.
- Nicholson, L. (2023, May 8). *Meeting Perennials. Kernza in Context educational activity. Understanding plant relationships (intercropping).* Washington Elementary Tour of The Land Institute. Salina, KS.
- Reser, A. & Meier, E. (2023, May 9-11). Continuous Living Cover Value Chain Coordinators Meeting. Madison, WI.
- Bajgain, P., Gutknecht, J, &. Jungers, J. (2023, May 11). *Kernza in the Forever Green Initiative*. Minnesota Water Quality Certification Tour. St. Paul, MN.
- Bajgain, P., Gutknecht, J., & Jungers, J. (2023, May 15). *Kernza in the Forever Green Initiative*. Presentation to Minnesota Clean Water Council. St. Paul, MN.
- Jungers, J. (2023, May 17). *New crops to clean our drinking water*. Presentation to the Minnesota Youth Institute Field Immersion event. St. Paul, MN.
- Lazarus, W. & Fancher, H. (2023, May 23). *Economics of Intermediate Wheatgrass and Other Perennial Grains*. Presentation at monthly KernzaCAP seminar. Virtual.
- Pinto, P. (2023, May 24). *Kernza research update*. Organic cereals field day. West Madison, WI.
- Forever Green Initiative (2023, June 13). Grower-focused webinar on Kernza. Virtual.
- Bajgain, P. (2023, July 13). *Advances in Breeding, Production and Marketing*. Kernza Field Day. Madison, MN.
- Teller, A. (2023, July 25). *Social Sustainability of Kernza*. Presentation at monthly KernzaCAP seminar. Virtual.
- Singh, G., Gutknecht, J., & Jungers, J. (2023, August 6). *Nitrate Leaching and Crop Yield for Intermediate Wheatgrass (Kernza*®) *in the US Midwest* [Conference presentation]. Soil Water Conservation Society. Des Moines, IA.
- Meier, E., Singh, G., Guolong, L., Wilson, A., & Carrillo, L. (2023, August 6). *Personal reflections on the cultural roots of conservation: Connecting past to future in shaping a*

legacy of sustainability in agriculture [Conference presentation]. Soil Water Conservation Society. Des Moines, IA.

- Rebesquini, R. (2023, August 7). *Assessing fertility needs, crop yields, and environmental benefits of intermediate wheatgrass in Eastern Nebraska*. Soil and Water Conservation Society Annual Meeting. Des Moines, IA.
- Heins, B. (2023, August 22). *Kernza Intermediate Wheatgrass for grazing and dual purpose cover crop.* Presentation at monthly KernzaCAP seminar. Virtual.

Field Days

- Kernza Field day toolkit. Online toolkit with information about Kernza production to facilitate information sharing at field day events. <u>drive.google.com/drive/folders/1OqtHw5BNIaDvgWDJ-A8xWClna0zr0v2I?usp=sharing</u>
- KernzaCAP. (2023, August 9). 2023 Field Day Press Release. kernza.org/wp-content/uploads/May-2023-Field-Day-Press-Release-updated-Aug-9.pdf
- 2023, March 30. Kernza Taste & Tour for the Twin Cities Metro Growers Network at Finnegan's brewery, hosted by the Sustainable Farming Association. Minneapolis, MN.
- 2023, May 24. Organic Cereals Field Day at the West Madison Ag Research Station. Verona, WI.
- 2023, June 27. Soil Health Field Day at the Langdon Research Extension Center. Discussed Kernza agronomics, production, and marketing. Langdon, ND.
- 2023, July 10. Great River Greening Field Day. St. Peter, MN.
- 2023, July 12. Williston Research Extension Center Annual Field Day. Featured a Kernza soil pit. Williston, ND.
- 2023, July 13. Dickinson Research Extension Center Annual Field Day. Discussed Kernza marketing and dual-use as a forage and grain crop. Dickinson, ND.
- 2023, July 13. A-Frame Farm Field Day. Madison, MN.
- 2023, July 14. Sustainable Farming Association and University of Minnesota West Central Research and Outreach Center field day focused on Kernza grazing. Morris, MN.
- 2023, July 18. Carrington Research Extension Center Sustainable Ag Tour. Discussed Kernza's potential to address soil erosion and water quality issues. Carrington, ND.
- 2023, July 20. Western Colorado Research Center Field Day hosted by Colorado State University. Fruita, CO.
- 2023, July 20. Langdon Research Extension Center Annual Field Day. Introduced Kernza and its potential to address soil salinity issues. Langdon, ND.
- 2023, July 29. KernzaFest, hosted by the Lake Pepin Legacy Alliance. Stockholm, WI.
- 2023, Aug. 5. WI Natural Resources Foundation Kernza Field Day. Walworth Co., WI.
- 2023, Aug. 8. Future of Food Regenerative Field Day hosted by A Frame Farm and Naturally Minnesota. Dawson, MN.
- 2023, Aug. 9. Michael Fields Agricultural Institute field day. East Troy, WI.
- 2023, Aug. 16. Dustin Johnsrud farm field walk featuring 30 ac. of Kernza. Epping, ND.

- 2023, Aug. 17. New Mexico Agricultural Science Center Field Day. Farmington, NM.
- 2023, Aug. 17. Rosholt Field Day hosted by Pope County SWCD. Westport, MN.
- 2023, Aug. 25. SW Colorado Research Center Annual Field Day. Yellow Jacket, CO.
- 2023, Sept. 6. Joia Food and Fiber Farm Field Day. Charles City, IA.
- 2023, Sept. 19. Cover Crops, Intercropping, and Soil Health Field Day. Discussed Kernza growing and marketing and results from field trials. Fargo, ND.
- 2023, Sept. 30. Great River Greening Kernza and Water Quality Event. St. Peter, MN.

Project Tools and Protocols

- KernzaCAP collection on the University of Minnesota Digital Conservancy. Permanent online location for KernzaCAP products. https://conservancy.umn.edu/handle/11299/255777
- Year 3 KernzaCAP Quarterly newsletters https://kernza.org/field-notes/?category=kernza-cap-newsletter
- Kernza in Context monthly newsletters 12 issues sent to teacher-researchers and others interested in the Kernza in Context curriculum development.
- Kernza in Context educational lessons 16 new lessons drafted and disseminated for beta testing.
- KernzaCAP data collection and use protocol. Finalized October 2023. Outlines processes for collecting and using project data, including QA/QC protocols.
- Soil water infiltration protocol. Finalized September 2023. Outlines process for measuring infiltration at field experiment sites.
- Data tracking spreadsheet. System to organize data collection templates across experiment sites and track when sites enter data.
- 2023 KernzaCAP race & equity framework with workplan. Updated each year to guide the project's DEI work.
- Social Network Analysis report, based 151 responses to the June 2022 SNA survey. <u>https://drive.google.com/file/d/1UqNYOqC8Ujlu3EM0cCS6tr2i_RI4rLpG/view</u>
- Kernza Stewards Alliance synthesis memo. February 2022. Scoping memo to facilitate setting up the Kernza Stewards Alliance.
- Kernza Consortium synthesis memo. August 2023. Summary of insights and strategic questions shared by focus group participants to guide Consortium development.
- Inclusive hiring resources toolkit. Best practices for KernzaCAP collaborators to encourage equitable hiring processes.

Appendix A: Collaborator List & Advisory Committee

Collaborator List

- Christopher Abbott, Co-Founder, Perennial Pantry
- Obed Aduama, Masters Student, University of Minnesota
- Jim Anderson, Professor, University of Minnesota
- George Annor, Assistant Professor, University of Minnesota
- Alicia Baddorf, Sustainable Supply Chain Coordinator, University of California-Davis
- Prabin Bajgain, Research Assistant Professor, University of Minnesota
- Cynthia Bartel, Principal, C. Bartel Inc.
- Andrea Basche, Assistant Professor, University of Nebraska-Lincoln
- Michael Bell, Professor, University of Wisconsin-Madison
- Christie Biddle, Supply Chain Manager, Patagonia Provisions
- Nathaniel Brunsell, Professor, University of Kansas
- Tomás Cassani, Postdoctoral Researcher, The Land Institute
- Whitney Clark, Executive Director, Friends of the Mississippi River
- Jared Crain, Postdoctoral Fellow, Kansas State University
- Tim Crews, Director of Ecological Intensification, The Land Institute
- Steve Culman, Professor, Washington State University
- Colin Cureton, Director of Adoption and Scaling, UMN Forever Green Initiative
- Maura Curry, Soil Health Organizer, Land Stewardship Project
- Julie Dawson, Associate Professor, University of Wisconsin-Madison
- Lee DeHaan, Lead Scientist, The Land Institute
- Leonardo Deiss, Research Assistant Professor, The Ohio State University
- Madeline DuBois, Research Technician, The Land Institute
- Gwenael Engelskirchen, Sustainable Supply Chain Analyst, University of California-Davis
- Tannie Eshenaur, Planning Director, Minnesota Department of Health
- Hana Fancher, Market Stewardship Specialist, The Land Institute
- Soudeh Ghasemian, Masters Student, University of Kansas
- Jessica Gutknecht, Associate Professor, University of Minnesota
- Wonsook Ha, Hydrologist, United States Geological Survey
- Alyssa Hartman, Executive Director, Artisan Grain Collaborative
- Alex Heilman, Marketing Contractor, Perennial Promise Growers Cooperative
- Whilden Hughes, Farmer, W. Hughes Farms
- Pam (Baraem) Ismail, Professor, University of Minnesota
- Dustin Johnsrud, Farmer, Johnsrud Farms
- Nicholas Jordan, Professor, University of Minnesota, Forever Green Initiative
- Jacob Jungers, Assistant Professor, University of Minnesota
- Audrey Kalil, Plant Pathologist, North Dakota State University

- Clair Keene, Extension Specialist, Cropping Systems, North Dakota State University
- Jonathan Kilpatrick, Soil Health Specialist, Sustainable Farming Association
- Kurt Kimber, Farmer, Kimber Farms
- Tammy Kimbler, Director of Communications, The Land Institute
- Peter LaFontaine, Agricultural Policy Manager, Friends of the Mississippi River
- Greta Landis, Evaluation Specialist, University of Wisconsin-Madison
- Andrew Leach, Sustainable Commercialization Associate, Forever Green Initiative
- Amber Mase, Evaluation Specialist, University of Wisconsin-Madison
- Diane Mayerfeld, Sustainable Agriculture Coordinator, Extension, UW-Madison
- Erin Meier, Director, Green Lands Blue Waters
- Peter Miller, Chief Operating Officer, Sustain-a-Grain
- Steve Morse, Executive Director, Minnesota Environmental Partnership
- Sienna Nesser, Commercialization Research Specialist, Forever Green Initiative
- Lydia Nicholson, Post-Baccalaureate Researcher, The Land Institute
- Korede Olugbenle, Graduate Student, University of Wisconsin-Madison
- Ben Penner, Farmer, Penner Farms
- Tessa Peters, Commercialization Manager, The Land Institute
- Luke Peterson, Farmer, Peterson Farms
- Valentin Picasso, Assistant Professor, University of Wisconsin-Madison
- Priscila Pinto, Postdoctoral Researcher, University of Wisconsin-Madison
- Samuel Pratsch, Evaluation Specialist, University of Wisconsin-Madison
- Dorothy and John Priske, Farmers, Fountain Prairie Farm
- Roberta Rebesquini, University of Nebraska-Lincoln
- Evelyn Reilly, Research Project Assistant, KernzaCAP and Green Lands Blue Waters
- Aaron Reser, Associate Director, Green Lands Blue Waters
- Tara Ritter, KernzaCAP Project Manager, University of Minnesota
- Ben Robinson, Research Assistant, The Ohio State University
- Trevor Russell, Water Program Director, Friends of the Mississippi River
- Mercedes Santiago, Research Technician, The Land Institute
- Coleman Selfridge, Masters Student, University of Minnesota
- Gurparteet Singh, PhD Student, University of Minnesota
- Hannah Stoll, Graduate Research Assistant, University of Minnesota
- Dave Stoltenberg, Professor, University of Wisconsin-Madison
- Aubrey Streit Krug, Director of Ecosphere Studies, The Land Institute
- Nicole Tautges, Agroecologist, Michael Fields Agricultural Institute
- Jared Trost, Hydrologist, USGS, Upper Midwest Water Science Center
- Laura van der Pol, Lead Soil Scientist, The Land Institute
- Claire Wineman, Post-Baccalaureate Researcher, The Land Institute

Advisory Committee

- Liz Carlisle, Assistant Professor, University of California-Santa Barbara
- Constance Carlson, Assistant Statewide Director, UMN RSDPs
- Christophe David, Executive Director, ISARA
- Lydia English, Strategic Initiatives Coordinator, Practical Farmers of Iowa
- Carmen Fernholz, Farmer, A-Frame Farms
- Laura Hansen, Retired Research and Development lead, General Mills
- Mitch Hunter, Associate Director, Forever Green Initiative
- Bonnie Keeler, Assistant Professor, University of Minnesota
- Emily Luscombe, Natural Resources Director, Intertribal Agriculture Council
- Juli Obudzinski, Policy Consultant, Independent Consultant
- Korede Olugbenle, PhD Student, University of Wisconsin-Madison
- Hikaru Peterson, Professor, University of Minnesota
- Matt Ryan, Associate Professor, Cornell University
- Craig Sheaffer, Professor, University of Minnesota
- Rachel Stroer, President, The Land Institute
- Omar Tesdell, Associate Professor, Birzeit University
- Peggy Wagoner, Retired Project Leader, Rodale Institute

Appendix B: Year 2 All-Hands Meeting Agenda

Kernza[®]CAP

Year 2 All-Hands Meeting Agenda

Monday, October 24, 2022 // 10am-3pm central

10:00-10:15 - Welcome

10:15-12:00 - Objective Team & Project Updates

- Germplasm and trait evaluation
- Agronomy and on-farm knowledge
- Environmental quality
- Education, extension, and policy
- Supply chains and economics
- Integration
- Full project updates

12:00-12:30 - Race & Equity Self Evaluation & Reporting Openly

We will report openly on what we have accomplished so far and where we can do better. Breakout groups will discuss how we can better leverage existing tools and resources.

12:30-1:15 - Break

1:15-2:00 - Keynote

Aubrey Streit Krug (The Land Institute) and Omar Tesdell (Birzeit University) will discuss their ongoing research into the biogeography of intermediate wheatgrass.

2:00-2:45 - Kernza Milestones & Model for Future Perennial Crops

We will spend time in breakout groups reflecting on building a model for future perennial crops. Groups will identify top milestones in their topic area and discuss what worked and what didn't in reaching those milestones. Please review the Kernza timeline as preparation for this session.

- Communications and messaging
- Policy
- Commercialization and product development
- Managing seed supply and varietal licensing
- Grower support
- Education and extension
- Transdisciplinary research

2:45-3:00 - Closing

Appendix C: Year 3 All-Hands Meeting Agenda

Kernza®CAP

Annual All-Hands Meeting

Wednesday, June 21st, 2023 // 1:00-5:30 pm

The Graduate Minneapolis

2nd floor, Pinnacle Ballroom 615 Washington Ave SE Minneapolis, MN 55414

- 12:00-1:00 Registration
- 1:00-1:15 Welcome and announcements

1:15-2:15 Objective team updates

- Germplasm and Trait Evaluation
- Agronomy
- Environmental Quality
- 2:15-2:30 Networking break

2:30-3:30 Objective team updates

- Education, Extension, and Policy
- Supply Chains and Economics
- Integration
- 3:30-3:45 Networking break

3:45-5:15 What are we learning through KernzaCAP that we can apply to future perennial crops and funding opportunities?

The KernzaCAP evaluation team will guide participants through three discussion prompts to reflect on the project:

- 1. What are we not doing that we should start doing, or start doing more?
- 2. What are we doing that we can stop doing, or change our approach?
- 3. What is going well that we should sustain or continue?

5:15-5:30 Closing

6:00-10:00 Optional welcome reception at Tattersall Distilling