

An Experiment for Now and the Future

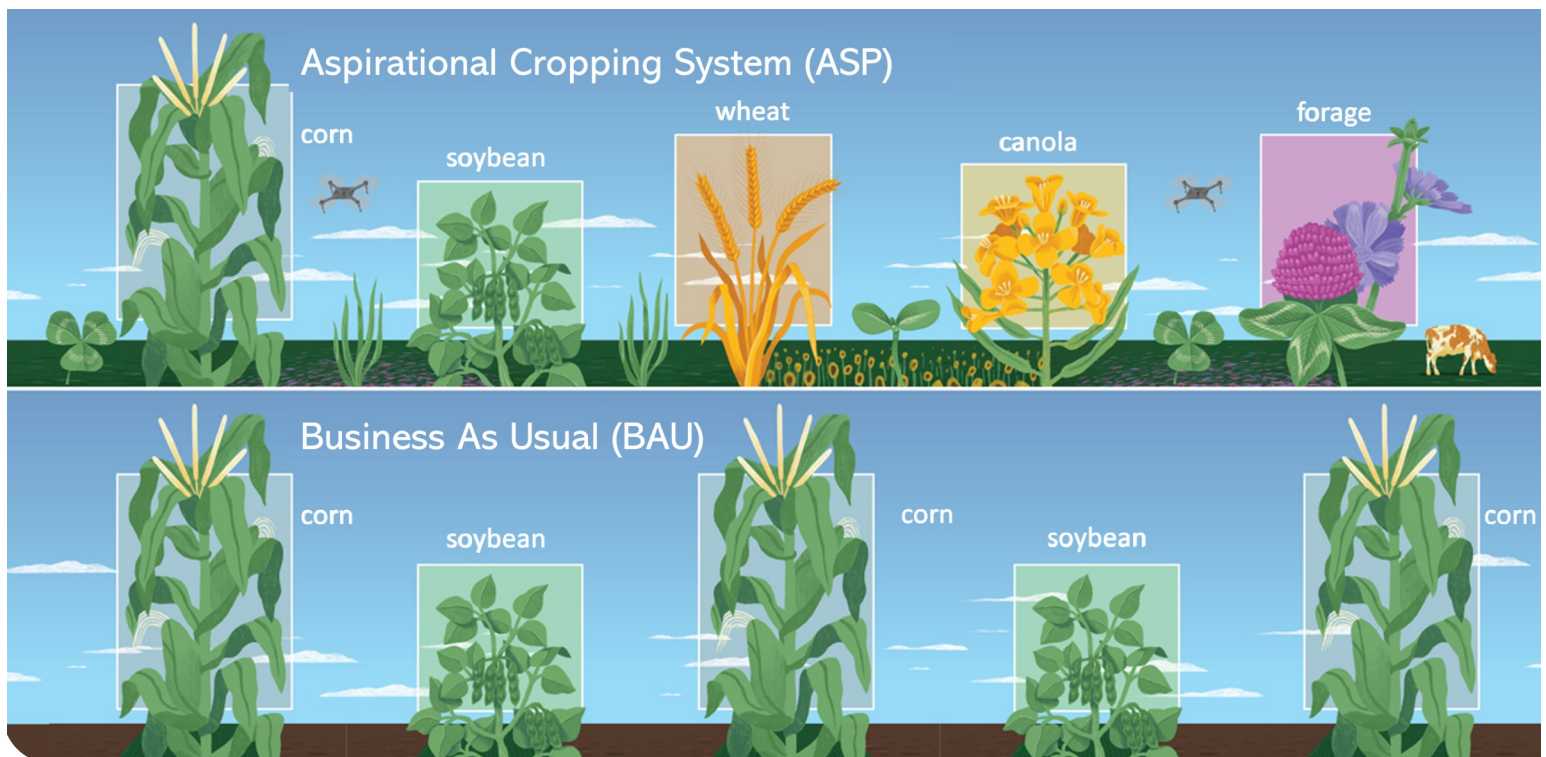
MSU’s Kellogg Biological Station Long-Term Agroecosystem Research site (KBS LTAR) is part of the [U.S. LTAR Network](#) established by the USDA to develop national strategies for the sustainable intensification of agricultural production. LTAR is a partnership among 18 long-term research sites across the U.S.

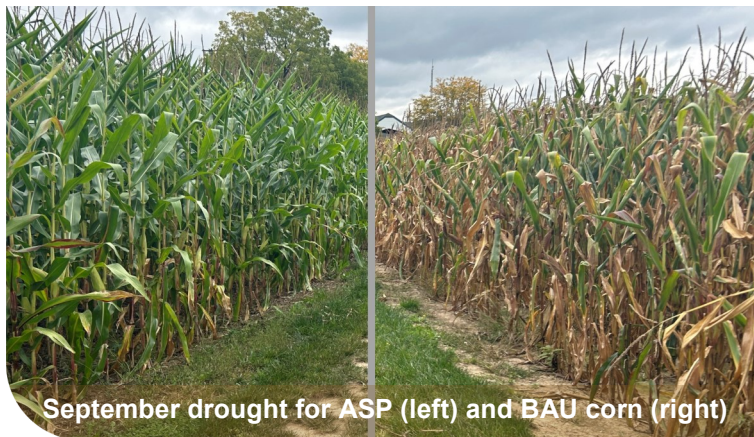
At KBS, we are helping to meet future sustainability challenges for cropping systems of the upper Midwest. Our research is co-designed with stakeholders to advance both food production and positive environmental and societal outcomes for agriculture.

Our signature experiment is the Aspirational Cropping System Experiment, sketched below, designed by stakeholders and researchers to embody state-of-the-art practices to deliver positive outcomes – high productivity and economic returns, clean water and air, climate resilience and mitigation, soil health, and biodiversity benefits like pollination and pest suppression. As technology and farming systems evolve over the years, so too will our aspirational system – helping to define the practices that will, when combined, provide the greatest returns for farmers and the environment and help lead agriculture into the future.

From the Director *by Phil Robertson*

Welcome to the first KBS LTAR Newsletter – If you’re new to LTAR, you’ll find a brief description to your left. If you’re not, you’ll know that two years ago MSU joined the national network of Long-Term Agroecosystem Research sites with USDA funding that allows researchers to push the boundaries of regenerative agriculture in a unique partnership with state and national stakeholders. We’re pleased to showcase here examples of research and outreach accomplishments that highlight our intent to contribute to the long-term success of Michigan agriculture. Although it’s early days for a program that aspires to bridge the gap between the agriculture of today and that needed by future generations, we also aim to produce usable results early on. Join us as we help to build the foundation for sustainable cropping systems that deliver multiple benefits for farmers and society.





September drought for ASP (left) and BAU corn (right)



LTAR field day 2023

Agronomy & Economics

Two drought periods book-ended the 2023 growing season and provided great learning opportunities during the 2nd year of the KBS LTAR Aspirational Cropping System Experiment.

- Spring drought challenged the ASP crops. Winter wheat and canola suffered from a lack of moisture during critical grain fill periods.
- Slug herbivory severely damaged winter canola crop in some areas, particularly in field depressions.
- Late termination of cover crops depleted soil moisture, which reduced ASP corn and soybean emergence and early season growth.
- ASP corn and soybean crops showed promising vigor in late-summer while BAU crops withered in the late September drought (header picture).
- Perennial forages were limited by soil moisture after the first cutting in mid-May.

Overall, the ASP cropping system was profitable (\$223/A) but less so than the BAU cropping system (\$315/A), largely because of lower profit from ASP canola and a net loss from ASP forage. The table below gives additional details.

2023 SUMMARY	Business-As-Usual		Aspirational	
	Yield	Profit	Yield	Profit
Corn	179.1 Bu/A	\$279.69/A	161.5 Bu/A	\$315.45/A
Soybeans	52.46 Bu/A	\$349.47/A	47.9 Bu/A	\$322.17/A
Wheat Grain			64.86 Bu/A	\$190.46/A
Wheat Straw			1.4 Tons/A	\$112.20/A
Cover Crop Forage			1.6 Tons/A	\$29.61/A
ASP Wheat Total				\$332.27/A
ASP Winter Canola			1,773 lb/A	\$190.11/A
ASP Forage			2.1 Tons/A	-\$44.88/A
Whole System		\$315/A		\$223/A

Partners & Field Days

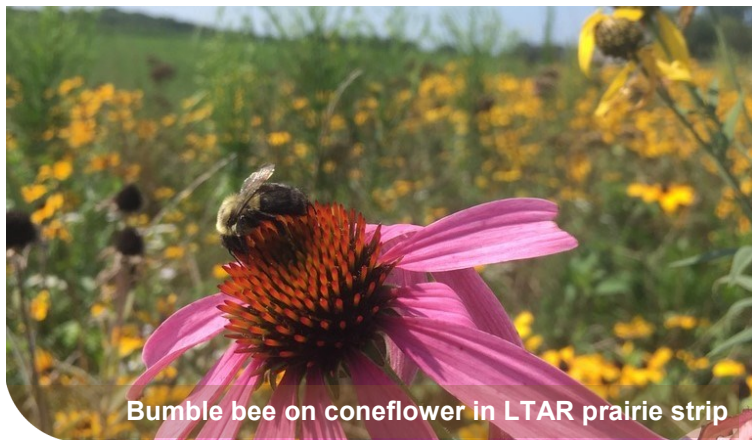
Last January the KBS LTAR Stakeholder Advisory Board was formed with 15 initial members who committed to two years of working closely with the KBS LTAR Scientific Steering Committee to guide the direction and priorities for LTAR research and outreach. At a summer workshop the team identified a shared purpose of *bridging the gap between the agricultural systems needed by present and future generations.*

In September we held our first annual KBS LTAR Field Day, co-hosted with MSU Extension. Over 90 farmers, agriculture and conservation professionals, and scientists participated in a day-long tour of LTAR field sites and research



The KBS LTAR hosted many tours in 2023, including this group from the Nature Conservancy, World Wildlife Fund, and the Environmental Defense Fund.

presentations. Laura Campbell, our Stakeholder Advisory Board chairperson and Senior Conservation and Regulatory Relations Specialist for the Michigan Farm Bureau, [shared that the day](#) “included innovative ideas on how to make conservation practices work on farms and provided information to farmers on what works, what doesn't, and how both farms and LTAR research can adapt to future challenges.” You can find a summary of the day on a recent [blog post](#) on our website. The field day will be an annual event – stay tuned for Fall 2024!



Bumble bee on coneflower in LTAR prairie strip



Dave Weed & Kevin Kahmark install lysimeters in ACSE

Insect Research is Buzzing

A major goal of the LTAR Aspirational Cropping System is to enhance biodiversity across many different organismal groups. Research on insects topped the list in 2023.

MSU PhD student DeShae Dillard studies flies as potential indicators of productivity, resilience, and other ecosystem services in Michigan row crops. Flies are the most abundant insect in agriculture and recognized for contributions to pollination, biological control, decomposition, and nutrient cycling. To date, DeShae has captured and individually examined over 5,000 flies belonging to 46 different taxonomic groups in LTAR cropping systems.



DeShae Dillard and Jenna Byrne set up fly traps

MSU PhD student Alice Dykstra investigates how prairie strips affect beneficial insects, in particular pollinators and parasitoid wasps and flies. She aims to reveal how insects in prairie patches can benefit adjacent cropping systems with pollination and pest suppression services.

MSU PhD student Katherine Hulting evaluates how the spatial distribution of prairie habitat might affect plant-pollinator interactions. In particular she examines whether many small patches affect pollination dynamics differently than fewer large patches.

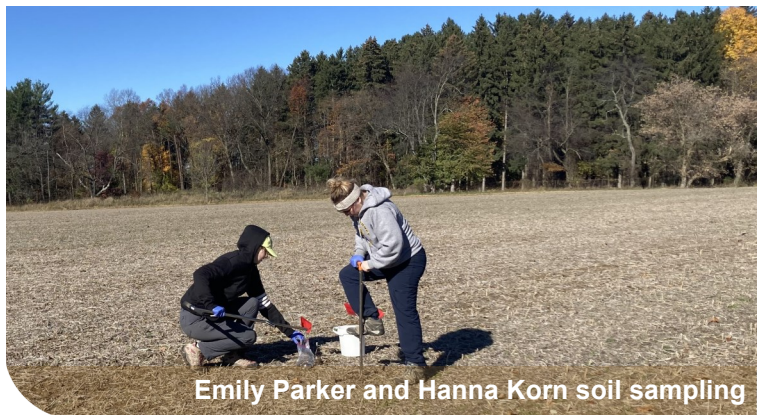
Many hands are busy this winter identifying insects, counting and weighing seeds, and preparing data to summarize the net impact that the KBS LTAR Aspirational Cropping System (and associated prairie strips) has on insect biodiversity, including how those insects may improve crop performance.

Full-Funding Brings New Research

In May 2023 the KBS LTAR became a fully-funded site in the national LTAR Network thanks to the many stakeholders who influenced congressional appropriations. The Network is led by the USDA’s Agricultural Research Service, which provides ~\$850,000 annually to support the Network’s mission of “long-term transdisciplinary and networked research to create innovative tools and practices and regionally-tailored, evidence-based knowledge to support adaptable, resilient, and sustainable agriculture.”

With full funding the KBS LTAR is making initial investments in lysimeters to measure water quality (e.g. nitrogen and phosphorus leaching) and in eddy covariance towers to measure greenhouse gas exchange. The equipment is being installed in small-plots and larger-fields to capture both spatial and temporal variability. For instance, we will be able to identify how installing perennial grasses in low-yielding areas influences a field’s overall greenhouse gas footprint. These data have the potential to inform practice standards for the Natural Resources Conservation Services (NRCS), as well as Inflation Reduction Act policies that aim to pay farmers for climate mitigating practices.

Also with full-funding we have been able to increase support for staff and researchers to collect data on productivity, economics, soil health, and insect ecology in these systems. Many research groups from MSU and other institutions across the country are already utilizing KBS LTAR to collect and analyze data, and we look forward to seeing this number increase!



Emily Parker and Hanna Korn soil sampling

OUR TEAM

Leadership



Phil Robertson Tayler Ulbrich Brook Wilke

Scientific Steering Committee

Bruno Basso, Sarah Evans, Nick Haddad, Sasha Kravchenko, Doug Landis, Sandy Marquart-Pyatt, Christine Sprunger

Systems Integration Team

Dean Baas, Jennifer Blesh, Tim Boring, Kim Cassida, Marc Hasenick, Manni Singh

Stakeholder Advisory Board

Laura Campbell (Chair), Adam Reimer (Vice-Chair), Christine Charles, Julie Doll, Colleen Forestieri, Randy Heinze, Cade Klein, Henry Miller, Mark Mills, Kristin Poley, Sherman Reed, Melissa Shaw, Jason Stegink, Ben Wickerham, Lisa Woodke

Upcoming Events

June: Small Grains & Canola Field Day

Aug/Sept: 2024 LTAR Field Day

Stay tuned for additional details!

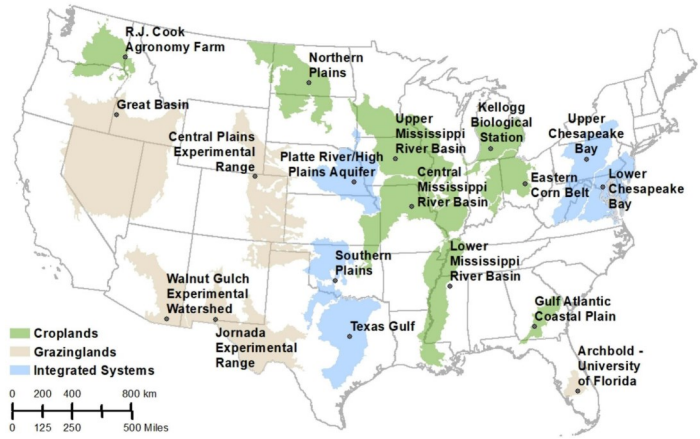
Contact Us

Email Kbs.ltar@msu.edu to get involved or be included in our list-serv.

Website: ltar.kbs.msu.edu



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LTAR Network Update

The LTAR network, under the direction of Dr. Teferi Tsegaye, completed a multi-year strategic planning process in 2023, resulting in refreshed visions and goals as well as three strategic science initiatives for the Network:

- Core performance indicators for agricultural innovation
- Science for climate smart agriculture
- Understanding the adoption of climate-smart solutions and agricultural innovations

Hundreds of scientists working across 18 LTAR sites will prioritize these research initiatives for local, multi-site, and network-wide projects. One way this work is carried out is through LTAR Working Groups that organize LTAR scientists around agroecosystem performance outcomes such as water quality, soil health, biodiversity, and greenhouse gas emissions; and cross-site experiments such as the Cropland Common Experiment. Working Groups provide platforms for coordinated science across sites, such as recent efforts to calculate phosphorus budgets for U.S. cropping and grazing systems.

The Network celebrated its first 10 years with a multi-day symposium at the National Agronomy, Soil Science, and Crop Sciences meeting in St. Louis, MO in November. The meeting attracts over 4,000 agricultural scientists, and KBS LTAR researchers – students, postdocs, and faculty – presented a half dozen symposia talks.

Staff Appreciation

Big thanks to Josh Dykstra and Tyson Robbins for their contributions to the KBS LTAR. Josh and Tyson provide on-the-ground leadership to manage 300 acres of LTAR crops, gather samples, and collect data. Tyson joined KBS in 2018 and serves as the KBS Crop Farm Manager and also supports the LTAR. Josh began in 2009 and provides agronomic and technical support for dozens of KBS researchers. Thank you both!



Tyson Robbins



Josh Dykstra



AgBioResearch
MICHIGAN STATE UNIVERSITY