2019 Annual Report of Accomplishments and Results

Wisconsin
University of Wisconsin-Madison
Wisconsin Agricultural Experiment Station
University of Wisconsin-Madison Division of Extension

I.   Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

1. **Executive Summary** (Optional)
The Wisconsin Agricultural Experiment Station (WAES), which is part of the College of Agricultural and Life Sciences (CALS) and the University of Wisconsin - Madison Division of Extension (UWEX or Extension) are partners who work together to generate new and exciting research-based knowledge and deliver that knowledge to Wisconsin's residents and communities to help address challenges and reach their goals. Smith-Lever funding provides about a fifth of Extension's annual funds, and Hatch funding provides an estimate of 7 percent of annual research funds for CALS/WAES. However, this funding provides the vital basis for research-based information and programming to individuals, communities, businesses, and local governments in Wisconsin. In addition, Smith-Lever funding provides the legal basis for additional funding provided by the State of Wisconsin. To reflect the vital nature of NIFA Capacity Funds for the people of Wisconsin, this report includes information from all programmatic activities at WAES and UWEX. **Scope of Education & Research:** For 2019, WAES supported 113 projects that covered all aspects of agriculture, dairy, food accessibility, nutrition, natural resources and educating rural farmers and communities. In 2019, Extension educators and researchers have reported over 540,000 direct outreach contacts. This includes participants from programs funded by state funds, federal funds, grant funds and nutrition education programs (EFNEP and SNAP-Ed). Extension researchers and educators have made an estimated 2.5 million educational contacts through conferences, community events and fairs. Additionally, they have made an estimated 19.5 million educational contacts through television and radio, and an estimated 2 million educational contacts via podcasts, digital videos and educational or scientific apps. **Scope of Volunteer engagement:** Our mission is to empower the people of Wisconsin. To this end, we mobilize, educate and support 13,000 volunteers across the State of Wisconsin, supporting them in protecting and improving Wisconsin's communities, businesses, and natural resources. Our flagship volunteer programs focus on youth development (Wisconsin 4-H), the preservation of Wisconsin's natural resources (Wisconsin Master Naturalist Program; Wisconsin Water Action Volunteer Program) and the support of local food systems and vibrant communities (Wisconsin Master Gardener Program). In 2019, Extension volunteers have provided over 710,000 hours of service; this is the equivalent of approximately 341 full-time employees.

Project Spotlights in this Report

The following research and outreach highlights help showcase some of our recent efforts that address our critical issues.

Food Security-Crops: *Cranberry cold hardiness in relation to dormancy and bud development*-Breeding cranberries to survive harsh weather will help Wisconsin growers adapt to new weather challenges caused by climate change, open the door to growing these crops in other parts of the world, and help expand scientific understanding of cranberries and other flowering fruits.

Food Security-Livestock: *Prediction of subclinical ketosis predisposition in dairy cows through genomic risk analysis.* This project led to the development of a prediction model to diagnose cows with subclinical ketosis based on a simple milk test, as well as a genetic tool to identify cows with a predisposition for ketosis. These tools can help dairy producers make better management and nutrition decisions that support animal health and milking productivity.

Food Security- Livestock: *Spatiotemporal analysis of dairy farm profitability and distributional impact of the Margin Protection Program*-This project found that dairy farms that are more efficient in milk production are more likely to emit less GHG pollution for a given amount of milk output.

Food Security-Accessibility: *Connecting farmers, gardeners, and food pantries to make healthy produce accessible to all Wisconsin residents.* Extension facilitates various cross-disciplinary efforts to connect growers of food with food pantries, leading to the donation of close to 100,000 pounds to Wisconsinites in need.

Food Security-Accessibility: *Using Data to Help Farmers Markets Make Data-Driven Decisions and to Expand Access to Healthy Foods.* We are providing and maintaining a data analysis and collection toolkit for farmers market managers so that they can make evidence-based decisions and expand their data literacy as professionals in a complex social, political, and micro-economic environment.

Climate Change and Energy: *The role of microbial symbionts in substrate specialization in leaf-cutter ants*-The project identified 161 biomass-degrading enzymes. These enzymes can be used to synthesize genes that may be utilized in the engineering of microbes for industrial bioenergy production.

Sustainable use of Natural Resources: *Engaging and Educating Forest Land Owners to ensure Healthy Forests and High-Quality Resources for Wisconsin's Forest Products Economy.* This program supports aging forest owners in forest management and in planning for the next generation of woodland owners to ensure the quality and availability of forest products to the Wisconsin economy.

Sustainable use of Natural Resources: *Empowering Residents to Conserve Wisconsin's Natural Resources through training Master Naturalists.* This program brings together and educates farmers, hunters, college students, retirees, teachers, professionals and many more so that they can be effective and informed community leaders in protecting Wisconsin's land and water.

Nutrition: *Role of Colonic Polyphenol Metabolism Anti-inflammatory Activity of Aronia Berries.* It was discovered that the consumption of aronia berries significantly increases the diversity of gut microbial communities.

Food Safety: *Supporting our Beef Industry in Producing Safer Wisconsin Beef.* Our Beef Quality Assurance certification program supports the Beef Industry in making the production environment safe for producers and their animals, and to subsequently ensure consumers that the meat they eat is safe to consume.

Food Safety: *Supporting Wisconsin Food Entrepreneurship & Ensuring the Availability of Safe Food through Food Safety Training.* By providing a variety of food safety training and science-based consulting, we support Wisconsin entrepreneurship and help ensure the production of safe food for all residents in the United States.

Education & Science Literacy: *Engaging underrepresented communities in STEM to prepare them for science-based jobs and to diversify the STEM labor workforce.* Through a variety of partnerships, the Research Accelerators program engages underrepresented minority populations with high quality STEM learning experiences.

Rural Prosperity: *Supporting Farm Managers in Positioning themselves as Employers of Choice to Attract and Retain High-Quality, Local Talent.* Through the "Employer of Choice" program, farm managers become better and more effective human resource managers. Through this, they can attract and retain a quality workforce in a very competitive labor market.

Rural Prosperity: *Supporting rural residents in accessing critical financial reports to enhance their credit health.* This messaging campaign supports rural Wisconsinites in checking their credit score, allowing them to detect identity theft and thus protecting their financial security.

Wisconsin Competitive Program: *Improving oxidative stability in muscle foods by phospholipid hydrolysis and examination of the mechanism Involved.* Researchers aimed to understand how PLA2 was inhibiting oxidation, and thus optimize its use as an antioxidant in fish and other meats.

Key Administrative Changes

Key Administrative Change (I): UW-Extension's merger with UW-Madison. As an effect of a recent re-organization of the University of Wisconsin-System, Extension is formally a division of the University of Wisconsin-Madison as of July 1, 2019. This allows us to deepen county-campus relationships, to streamline administrative processes, and to reduce administrative barriers related to ad-hoc and emergent collaborations related to research, student engagement and science-based outreach.

Key Administrative Change (II): By hiring Extension Program Managers, Extension finalized its internal reorganization in the wake of the State of Wisconsin's 2015 budget cuts to the UW System. Extension's 29 Program Managers take leadership related to state-wide programmatic planning, program-related needs assessments, and they coordinate the development of common measures for programmatic output, outcomes, and impacts. Fourteen of these positions were filled in 2018, and 15 were hired in 2019, with only 3 remaining open positions to be filled in 2020. As content specialists and programmatic

leaders, our Program Managers play a pivotal role in connecting faculty and state specialists with local educators. Their work ensures that we maintain a generative balance between local and state-wide needs, and that different program areas can efficiently collaborate as we respond to ongoing and emerging issues.

Key Administrative Change (III): Establishing an Office of Access, Inclusion, and Compliance (OAIC): According to the 2018 American Community Survey 1-year estimates, 19.0% of Wisconsin's population are residents of color. In terms of the state's linguistic diversity, approximately 8.8% percent of residents speak a language other than English within their household. Among the estimates provided on the largest language communities, 4.8% (n=261,707) of residents primarily speak Spanish, 0.7% (n=38,605) of the population speaks Hmong (inclusive of all dialects), and 0.3% (n=16,054) of the populations speaks Chinese (inclusive of all dialects). Even though estimates on Wisconsin's bi/multilingual populations and communities of color are both below national averages, Extension has strategically responded to the need for more robust and strategic efforts to reach state populations that, from both historical and modern perspectives, continue to be underserved by the land-grant activities. In October 2019, the Division of Extension established the Office of Access, Inclusion, and Compliance (OAIC) to prioritize key initiatives that help expand access to programming across the state and strengthen our institutional commitment to inclusive excellence. The OAIC focuses on ensuring programming compliance with federal non-discrimination laws and policies, provides consultative support for educators and specialists on their programmatic efforts, and leads initiatives aimed to attract, support, retain, and develop a diverse workforce. Given the complexities associated with providing programs and services that cross many lines of linguistic and cultural difference, our nationally recognized Language Access Team plays a key role within the OAIC. Our cadre of language professionals to ensure that the quality of our programs, services, and resources are both culturally responsive and linguistically appropriate.

Key Administrative Change (IV): Extension has moved away from housing programmatic support specialists in a separate support unit. In 2019, program development and evaluation staff as well as data governance staff have been integrated into the programmatic wing of our organization. To ensure that program-specific needs related to evaluation, program development and state-wide programmatic data are being efficiently met, programmatic support specialists are now under the supervision of our Associate Deans who directly oversee Extension's programmatic work. In the wake of this change and the change outlined above (Formation of the Office of Inclusion, Access, and Compliance), the former "Program Support Services" Unit has been dissolved.

Key Administrative Change (V): Hiring of the Dean through a national search. A national search was initiated in 2019, and successfully concluded as of April 28, 2020. Karl Martin has been selected as the Dean of Extension, with a formal appointment start date of May 1, 2020.

II.   Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates
1. The <u>Merit Review Process</u>	Extension activities are determined and reviewed through ongoing assessment of local needs and program planning processes. Extension Programs develop annual program plans of work, and those program plans of work support the development of individual plans of work for faculty and staff. Plans of work describe the specific needs that will be addressed, as well as target audiences, racial equity strategies, intended outcomes, action plans for how to achieve outcomes, and evaluation plans. Plans of work are reviewed by program leadership and by Area Extension Directors and serve as a roadmap for subsequent programmatic assessments of community impact. Extension curricula and publications are peer reviewed by research and extension faculty, government or industry colleagues and professionals as appropriate to the content, purpose and intended audience. Additionally, scholarly peer review and cultural review assure the quality and relevance of educational materials and outreach scholarship. Extension has actively developed and is expanding a multi-cultural and multi-linguistic programming portfolio that acknowledges the reality that Wisconsin is a culturally and linguistically diverse state. In order to assure the educational and scientific quality of this portfolio, and to additionally ensure cultural appropriateness and effectiveness, translations and interpretations are managed and reviewed by our nationally recognized Language Access team.
2. The <u>Scientific Peer Review Process</u>	No Updates.

III.   Stakeholder Input

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates
1. **Actions taken to seek stakeholder input that encouraged their participation with a brief explanation**	UW-Madison hosted 23 field days at 12 agricultural research stations around the state of Wisconsin. Field days, which included many opportunities for researchers to gather input from attendees, covered a wide range of topics from best practices for production methods related to crops, soils and livestock to specific advances in no-till for all soil types, organic cover crops and tips for home gardeners. All events are free and open to the public and are well publicized through the agricultural media and by collaborating partner organizations (e.g., Commercial Flower Growers, the Midwest Organic and Sustainable Education Service, the Wisconsin Alumni Association). For the first time this year we actively promoted our largest field days through Spanish-language media releases and outreach to Spanish-language press in the state of Wisconsin. Links to the releases: https://news.cals.wisc.edu/2019/06/25/uw-madison-centros-de-investigacion-agricola-agricultural-research-stations-eventos-en-2019/ https://news.cals.wisc.edu/2019/07/17/todos-son-bienvenidos-al-evento-de-horticultura-en-el-uw-centro-de-investigacion-agricola-de-west-madison/ https://news.cals.wisc.edu/2019/08/09/evento-publico-sobre-la-agronomia-y-los-suelos-el-28-de-agosto/ Agricultural Station field day link: https://ecals.cals.wisc.edu/2019/06/24/uw-madison-agricultural-research-station-field-days-for-2019-season/ Agriculture and water-related issues received a great deal of attention from policy-makers within the State of Wisconsin this year. Representatives from the college participated in a number of public hearings dedicated to increasing state funding for dairy research, water quality, funding for Extension positions throughout the UW System and state-level reporting of Extension research activities. These public hearings provided a formal mechanism to hear from many residents and stakeholder groups.

2. Methods to identify individuals and groups and brief explanation.	The CALS leadership maintains a close relationship with leaders of the industry and advocacy groups that have an interest in disciplines we study. The college's Board of Visitors meets twice per year and formally provides input to the dean and other college leaders on our research, instructional and outreach missions. Several academic departments also have their own advisory groups, whose feedback is shared with the dean through department chairs. Beyond advisory groups convened by the college and its departments, leaders frequently meet with Wisconsin commodity groups at their invitation (e.g., Cranberry Growers, Wisconsin Potato and Vegetable Growers, GrassWorks, Apple Growers). The dean is also invited to attend a joint meeting of the Wisconsin Agricultural Coalition at least twice annually; this group is made up of executive directors of each of the Wisconsin commodity groups. CALS offers training for those interested in getting started in agriculture. Those programs include: The Farm and Industry Short Course, the School for Beginning Dairy Farmers, the School for Beginning Market Growers, Cut Flowers Growers School, and the School for Beginning Apple Growers In addition to established producer groups, we also intentionally reach out to groups organized around new and expanding Wisconsin agricultural sectors. The annual Wisconsin Agricultural Outlook event brought in a record crowd of agricultural professionals and policy-makers. The special emphasis for this year was on hemp production and economics, which attracted a number of new audiences to this traditional program.
3. Methods for collecting stakeholder input and brief explanation.	Membership on the college's Board of Visitors is thoughtfully balanced to represent all our disciplines, geographies and mission areas. We solicit nominations from our academic departments, our commodity partners, the non-profit alumni association dedicated to supporting CALS and from current and past board members. We strive for gender balance and representation from all ethnic groups and believe this will become easier as our recent graduates, who represent greater gender and ethnic diversity, continue to progress in their careers. We collect as much input as possible through in-person meetings and other discussions. Examples of meetings with a variety of stakeholders in 2019 include:

	· Launch of a new dairy industry advisory council formed to help shape $7.8M in new state funding approved this year for dairy research at three University of Wisconsin campuses · Discussions with members of the Meat Science and Animal Biologics Discovery industry advisory group on potential growth opportunities in this area made possible by the pending completion of a new on-campus research facility focused on animal biologics and meat processing · Board members of the non-profit Wisconsin Crop Improvement Association, dedicated to certifying seed quality, which partners with the Wisconsin Alumni Research Foundation to sub-license small grain varieties developed by UW researchers · The Citizens Advisory Council of the Center for Integrate Agricultural Systems is a legislatively mandated body across a broad spectrum of agriculture, all focused on sustainable production systems.
4. **A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.**	In meeting with stakeholders, we continue to learn of their interests in many areas related to agriculture, natural resources and environment, food, energy, rural life and health issues, youth and families, and rural economic development. A recent survey of more than 30,000 readers of our publication (CALS/WAES Grow Magazine), showed our alumni are most interested in these topics: § Healthy ecosystems and environment 45% § Changing climate 45% § Health and wellness 43% § Food systems 42% § Basic science 31% § Bioenergy and biofuels 28% Of the 450 total survey respondents, 87% prefer to read the publication in print, including 80% of readers 49 and younger. Based on these responses, we will continue to distribute the publication as a mailed magazine, in addition to making articles available in a digital format.

IV.   Planned Program Table of Contents

No.	Program Name in order of appearance
1.	Global Food Security-Crops and Agronomic Plants
2.	Global Food Security-Livestock
3.	Global Food Security-Food Accessibility
4.	Climate Change and Energy Needs
5.	Sustainable use of Natural Resources
6.	Nutrition
7.	Food Safety
8.	Education and Science Literacy
9.	Rural Prosperity
10.	Wisconsin Competitive Program

V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	Cranberry Cold Hardiness in Relation to Dormancy and Bud Development	Issue: Dormant cranberry buds, which contain flower primordia, go through changes in their ability to withstand freezing temperatures both in fall and spring as they go into and out of dormancy. Cranberry growers in Wisconsin and other areas of the country will flood their beds to encapsulate the vines in ice and protect them from extreme cold temperature throughout winter. However, there are transition periods in fall and spring when temperatures are cold enough to cause damage to the buds but not cold enough to maintain ice on the vines, resulting in yield losses. These time periods and fluctuations in temperatures will become more extreme as weather patterns and climate changes. Growers, therefore, have asked for methods to test cold hardiness of cranberry vines during these periods. That information will help them when making decisions about harvesting, protection of plants during cold weather, and establishing ice cover in winter. What has been done: Researchers at the University of Wisconsin–Madison hypothesized that cranberries protected the terminal buds of their plants much in the same way that blueberries, another fruit crop from the same genus, do. Blueberries protect flower primordia – the tissue that will become the flower – during freezing conditions in winter by preventing the propagation of ice that is formed in nearby tissues. In this way, the flower primordia tissues remain unfrozen, and thus undamaged, regardless of ice formation in other areas of the plant. It turns out, however, that cranberries do not work this way. So, to understand the basic mechanism of how cranberries protect the flower primordia, researchers had to go back to the beginning. They collected terminal buds and exposed them to various freezing temperatures for differing amounts of time. Every other week, buds were removed and visually evaluated. The scientists found that in cranberries, bud scales (structures on the outside of the buds)	Global Food Security-Crops

| | | freeze, and the ice inside these structures pulls water away from the tissue inside the buds, effectively dehydrating the flower primordial. By dehydrating the flower primordia and decreasing the water content inside the buds, the flower primordia avoids freezing. Researchers were also able to collaborate with investigators in the Department of Medical Physics using magnetic resonance imaging (MRI) and scientists at the USDA in North Carolina using a thermal video camera to visualize the freezing of different bud structures and how ice propagates. Finally, using microscopy, the scientists found that an ice barrier forms in fall and dissipates in spring in the area that connects the buds to the stems, preventing the propagation of ice from other parts of the plant to the flower primordia.

Target audience/Impacts: Researchers now have a clearer understanding of how cranberry buds survive cold. They want to pass along this new information to breeders so that they can screen cranberry germplasms to find plants that are more cold tolerant and include those traits in new cranberry cultivars. Breeding cranberries to be more hardy in cold weather will become even more important as temperatures and weather patterns become more unpredictable. The work has opened a world of plant cold hardiness in other crops too, such as grapes and other fruits. Scientists throughout the United States and in Japan are now working with the UW–Madison scientists to complete their own studies of hardiness in fruit crops.

A graduate student was supported by this project. The researchers have one research paper in press, and another under review, with more being written. They have talked about the work to growers in Wisconsin (in the Wisconsin State Cranberry Growers Association) and the region, as well as in Canada. They presented the work at the International Plant Cold Hardiness Meeting and several professional horticulture conferences. They have also written articles about the work in extension publications. | |
| 2. | Prediction of Subclinical Ketosis Predisposition in Dairy Cows through Genomic Risk Analysis | Issue: Ketosis is a common metabolic disorder of early postpartum dairy cows that impairs milk production, reproduction, and health outcomes. Subclinical ketosis affects 40 to 60 percent of cows, although it can vary greatly between farms, and costs an average of $300 per case in treatment and lost productivity. It | Global Food Security-Livestock |

is important to catch ketosis as early as possible—in the subclinical stage, preferably—in order to intervene promptly to support cow health and milk production. The definitive test for ketosis requires a blood draw. Farmers would benefit from simpler tools that could detect ketosis early, including an improved milk-based diagnostic test that can be run as part of a farm's standard milk-based analyses. In addition, there is a genetic element to ketosis, and dairy producers would benefit from having a genetic test to identify cows that are predisposed to the disorder. This first-of-its-kind diagnostic tool would enable farmers to identify at-risk cows to target for proactive monitoring and management interventions.

What has been done/Results: A team of University of Wisconsin–Madison researchers, including an extension specialist, collected blood samples from 1000 cows at commercial dairy farms in Wisconsin to determine each cow's ketosis status. The team also collected information related to productivity and health status for each cow over the course of six months, including milk production levels, milk quality, milk spectrometry data, health problems, and reproductive efficiency. Using Artificial Neural Network (ANN) technology, they developed an improved milk sample-based approach to help predict and diagnose ketosis. The team also collected a hair sample from each cow for genotyping. They did a genome-wide association study (GWAS) to identify genetic markers associated with ketosis. They used this information to develop a genetic diagnostic tool to identify animals at increased risk for developing ketosis.

Target audience/Impacts: This project yielded two tools that will be valuable for dairy producers, nutritionists, and researchers. One is a prediction model to diagnose cows with subclinical ketosis based on a simple milk test. The second is genetic information to identify cows with a predisposition for ketosis, which will help farmers make more informed management and nutrition decisions. Both tools are data-intensive and require large computational resources. As a next step, the research team is collaborating with campus colleagues to implement these two tools through the Virtual Dairy Farm Brain project, a project that seeks to create a state-of-the-art suite of real-time integrated dairy farm management decision support tools and involves massive computing power.

During the project, researchers shared ketosis data and DNA sequencing data with the farmers they partnered with, providing them with valuable information

		about the ketosis status and genetic makeup of their cows. Members of the research team gave numerous talks at producer meetings and scientific conferences, and they wrote three papers for publication. Results from this project were used to help secure internal (UW–Madison) and external (USDA NIFA) grant support for the Virtual Dairy Farm Brain project.	
3.	Spatiotemporal Analysis of Dairy Farm Profitability and Distributional Impact of the Margin Protection Program	Issue: This project was initially designed to focus on the impacts of the Margin Protection Program, the voluntary risk management program for dairy producers authorized by the 2014 Farm Bill. However, there wasn't sufficient data available to do the proposed analysis. Instead, the research team utilized a different federal dataset to conduct a number of analyses related to the technical efficiency (productivity) and environmental efficiency (impact) of dairy farms across the U.S. As the dairy industry strives toward economic and environmental sustainability, it is necessary to have a fuller understanding of how various factors affect technical and environmental efficiency—and to develop improved, more comprehensive approaches to assess and quantify those measures. What has been done/Results: Using data from the USDA's Agricultural Resource Management Survey, a team of University of Wisconsin–Madison researchers, including an extension specialist: *Developed a more comprehensive way to measure productivity, taking into account factors that are typically ignored. Instead of just milk yield or farm revenue, their approach incorporates important input and output factors such as milk quality (including fat, protein, and somatic cell count), family labor, and homegrown animal feed. This new productivity analysis gives a more accurate picture of productivity. *Conducted an analysis of which dairy farms are the most efficient in terms of maximizing production and minimizing greenhouse gas (GHG) emissions. These outputs (one "good," one "bad") are linked, two results of the same process. This new approach emphasizes the importance of considering impacts on both types of output when making management decisions. Fortunately, there's a favorable relationship at play with these outputs. The researchers found that dairy farms that are more efficient in production tend to emit less GHG pollution.	Global Food Security-Livestock

		* Assessed the impact of the 2003 revision of the federal Clean Water Act on concentrated animal feeding operations (CAFOs). The analysis revealed that the 2003 revision, which imposed more stringent rules about manure management, had very limited impact on CAFOs (likely due to lack of monitoring and enforcement efforts). Target Audience/Impacts: These research findings are of interest to many scientists, economists, policy makers and dairy professionals. The findings have been shared at four annual scientific conferences and will be published in three papers. This work helped support the research efforts of two PhD students. The results from this project are being leveraged to apply for further grant funding through UW's Dairy Innovation Hub, a state-supported effort to address the most complex challenges facing the state's dairy industry.	
4.	Connecting Farmers, Gardeners and Food Pantries to make Healthy Produce Accessible to all Wisconsin Residents	As a traditionally agricultural state, Wisconsin prides itself in being one of the country's strongest producers of fresh vegetables and fruit. And yet, people in one of ten households in Wisconsin have uncertain or limited access to sufficient fresh produce for a healthy and active life. Residents who grow food, alongside community garden groups and professional farmers, strive to support their communities by making fresh produce available to all. But they often cannot do so because they do not have connections to local emergency food distribution systems, or because they have concerns around how to organize the process of supplying food to those in need. By intentionally connecting community gardens, farmers, university research stations and active residents with emergency food distribution organizations, Extension supports communities in providing access to healthy produce to all residents. In 2019, 50 food distribution sites across the state (food pantries, senior meal sites, schools, youth summer feeding programs, housing units) received fresh produce due to efforts facilitated by Extension agents and faculty. In the same period, close to 100,000 pounds of vegetables were provided to Wisconsin residents through Extension-supported efforts. For example, in Waushara County, Extension facilitated the donation of 2500 pounds of produce to local food pantries through a so-called 'gleaning' process. 'Gleaning' means to examine fields after harvest to donate the surplus product to	Global Food Security-Food Accessibility

| | | area food pantries, which in Waushara County typically had few fresh produce offerings.

An assessment by a local Extension agent and a local poverty alleviation initiative (Waushara Food Connections Workgroup) indicated that even sympathetic farmers were reluctant to invite volunteers into their fields to glean due to liability concerns. To address this obstacle, local Extension staff researched how other states and counties had navigated similar liability issues. They then worked with the County to put a rider on its insurance policy to reduce risks to partnering famers.

Rather than asking an area farmer to host a pilot for the gleaning process, Extension reached out to the nearby University of Wisconsin – Madison Hancock Research Station, a 412-acre vegetable research farm and field trial site for potatoes, field corn, sweet corn, soybeans, snap beans, carrots, cucumbers and others. Extension educators, UW researchers and community groups hosted a pilot gleaning project at the Research Station that was attended by local 4-H members and volunteers from local churches. The pilot included training on produce safety, so that volunteers would know how to safely glean vegetable fields on other farms.

This collaborative project illustrates the unique role of Extension in fostering innovative linkages between regional food production, university research resources, and local emergency food networks. As such, it served as a proof of concept for a local farm-to-pantry gleaning initiative, familiarized area vegetable producers with crucial food safety regulations. This specific pilot also eased farmers' liability concerns by addressing the insurance issue through negotiation with the county while ensuring that gleaning volunteers had proper food safety training. Most importantly, the collaboration resulted in the donation of approximately 2,500 pounds of food to local food pantries. Currently, the project team is identifying partnering farmers to expand the program in 2020. | |
| 5. | Using Data to Help Farmers Markets Make Data-Driven | Quality data is essential for managers of farmers markets if they want to make sound decisions that benefit customers, vendors and the community. Through | Global Food Security-Food Accessibility |

	Decisions and to Expand Access to Healthy Foods	the Farm2Fact (F2F) toolkit, Extension helps farmers market organizations and managers understand how their markets are performing across a variety of indicators, including average years in farming per vendor, average number of visitors per market day, and total dollar amount of sales through incentive programs such as Supplemental Nutrition Assistance Program (SNAP), the Women Infants and Children Program (WIC), and Senior Farmers' Market Nutrition Program (SFMNP). This information is crucial for farmers markets when it comes to making evidence-based decisions about vendor recruitment, market locations and scheduling, farmers market outreach, and other factors important to a market's success. Between 2018 and 2019, 45 farmers markets used the tool to obtain and collect data via the toolkit. Those 45 farmers markets were supported through additional data-driven consultations to help them develop reports, build relationships with stakeholders, and seek additional resources. Not only does this work build farmers market manager's ability to make decisions, but it also supports crucial data literacy for professionals in a complex social, political, and micro-economic environment. Market managers can use the information from the F2F Toolkit to better understand the audiences they are serving, and to grasp the impact on the local economy made by these audiences. For example, in 2018, the Village of Brown Deer Farmers Market used the F2F Toolkit to assess the economic impact of their farmers market and to analyze participation rates of federal nutrition assistance program recipients to assess how effectively they were serving low-income households. Based on this assessment, a team of Extension faculty and students from UW-Madison worked with a local funder and the Village of Brown Deer to hire a market outreach manager to conduct targeted outreach to participants of several federal nutrition assistance programs. The result was a 2019 pilot project to examine whether such a position could increase farmers market sales and enhance household access to fresh produce by increasing federal nutrition assistance program participants' usage of the Brown Deer Farmers Market. With guidance from the UW-Madison Extension team, the market access coordinator visited a total of 32 unique locations within the community, including schools,	

senior facilities, government committees, food pantries, laundromats, and apartments.

As a result of these data-driven outreach efforts, SNAP sales at Brown Deer Farmers Market increased from $512 to $4,397.75 between 2018 and 2019. In other words, after the implementation of the pilot program, participation in the most common incentive program increased by over 750%. Additionally, using F2F and the Local Foods Impact Calculator (https://calculator.localfoodeconomics.com) allowed Extension staff to estimate the overall economic contribution of the market on the local economy. On sales of $22,450, the local economic impact is estimated to be approximately $35,000. In 2020, the team plans to apply for new funding to expand the market outreach coordinator model to other markets in the Milwaukee metro area.

The Brown Deer Farmers Market Community Outreach story exemplifies how UW-Madison Division of Extension initiatives can incorporate data-driven tools developed by integrated faculty with place-based projects rooted in relationships to effect positive changes in communities, such as enhancing the affordability and availability of fresh food, which are key components of household food security. Our work makes it possible to benchmark farmers markets' performance so as to inform the implementation of targeted interventions, and to measure their impact. As this case demonstrates, targeted outreach to incentive program participants in Brown Deer, WI resulted in an increase in purchases of fresh, local farmers market products among SNAP, WIC, and SFMNP recipients, *and* it increased the sales for the farmers market vendors.

6.	The Role of Microbial Symbionts in Substrate Specialization in Leaf-Cutter Ants	Issue: Biofuels can help address climate change by reducing greenhouse gas emissions, but the process of converting plant matter into ethanol is highly inefficient. Scientists at the University of Wisconsin–Madison proposed searching for more efficient biofuel production methods by exploring processes that already exist in nature. Specifically, they aimed to analyze the genomes of microbes and microbial communities in natural environments where plant matter is broken down by enzymes. For example, leaf-cutter ants rely on grasses as their	Climate Change and Energy Needs

primary energy source and harvest plant matter to use as a substrate for growing fungi (i.e., fungus gardens), which they feed to their young.

What has been done: The researchers investigated the microbial communities associated with fungus-farming leaf-cutter ants, suspecting that the microbial communities of the fungus gardens have adapted for the efficient breakdown of plant matter. After collecting fungal samples in Brazil, the researchers analyzed fungal genomic data and bacterial community genomic data. They identified and quantified 1,766 different fungal proteins, including 161 biomass-degrading enzymes.

Their analysis found differences in the protein profiles in fungus gardens that were fed different substrates. When given leaves or flowers, which house most of their energy in tough-to-digest polymers, fungus gardens produced more proteins predicted to breakdown cellulose (the primary substance in plant cell walls). They also found that, when given a mix of things to feed on, fungus gardens would tend to breakdown the simpler, more digestible material. This flexible, substrate-specific enzymatic response of fungus gardens allows leaf-cutter ants to derive energy from a wide range of substrates.

Target Audience/Impacts: The biomass-degrading enzymes identified in this study can be used to synthesize genes that may be utilized in the engineering of microbes for industrial bioenergy production. The study also shows that, in future research, leaf-cutter ant fungus gardens can be manipulated experimentally — and their genomes then analyzed — to reveal microbial plant deconstruction mechanisms specific to certain substrates.

The research team developed a new educational activity for teaching K-12 students about leaf-cutter ants, symbiosis and modeling of biological systems; it was shared on a website (https://currielab.wisc.edu/outreach_education.php) and implemented at public outreach events. Three peer-reviewed journal articles, multiple academic conference presentations and a doctoral dissertation also stemmed from this study.

| 7. | Engaging and Educating Forest Land Owners to ensure Healthy Forests and High-Quality Resources for Wisconsin's Forest Products Economy | Extension is responding to both the aging forest ownership issue and the lack of engagement and planning of family-owned forests in several ways. To engage with the traditionally unengaged forest owners, we have developed a series of classes for woodland owners, called Learn About Your Land (LAYL). Class topics such as tree identification, introduction to programs and people, how to conduct a timber harvest, non-timber goods from your woods, and others seek to raise awareness and interest in more actively managing forests.

In 2019, 18 individual classes were held in 7 locations around the state. 176 individuals attended these classes, representing over 9,237 acres of woodlands. Our 2019 impact survey of the previous year's participants indicates that 62% of attendees had set up an appointment with a Wisconsin Department of Natural Resources (WDNR) forester for a walk through on their woodland as a result of the program. 60% had connected with a WDNR forester to discuss their woodland; and 53% developed a list of activities for their woodland. This indicates that our program effectively fosters engagement with forest land professionals, which in turn is crucial to ensuring healthy and productive forests. To address the issue of passing on privately-owned forest land to future generations, Extension additionally developed a program to help private woodland owners and their heirs plan for the future ownership of their woodlands ("Your Land, Your Legacy"). The class focuses on the legal and social aspects of planning for the next generation. The 2019 classes were held in three locations around the state, with 53 individuals representing 23 properties across the locations. An impact survey conducted in 2019 indicates that over a third of 2018 attendees had completed a trust or a will, and close to half of the attendees had made changes to an estate plan after the class. | Sustainable use of Natural Resources |
| 8. | Empowering Residents to Conserve Wisconsin's Natural Resources through training *Master Naturalists* | Addressing the environmental challenges facing Wisconsin and promoting sustainable use of the state's natural resources requires active participation from residents of all walks of life. College students, retirees, teachers, farmers, hunters, professionals and many more need to be properly equipped to help take care of Wisconsin's land and water. Through the *Master Naturalist* program, Extension is developing a network of trained and well-informed volunteers dedicated to conservation service within their communities. *Master Naturalists* actively engage with the state's natural environment while influencing others along the way. | Sustainable use of Natural Resources |

Over the past six years, Extension has developed and expanded the *Master Naturalist* program. Participants undergo training that entails 40 hours of science-based content related to geology, ecology, plant life, wildlife, water, water life, interpretation, and human influences related to Wisconsin's natural world. As a result, *Master Naturalists* partner with nature-based organizations across stewardship projects, citizen science and educational activities. They are volunteering with more than 700 organizations across the state, providing more than 123,000 volunteer hours since 2013.

In 2019, eleven *Master Naturalist* training sessions were hosted together with community-based organizations from across Wisconsin. In 2019, 165 people registered for our 40-hour training curriculum to join our network of more than 1,000 trained *Master Naturalists.* The training occurred both in nature and in the classroom and was led by Extension-trained partner organizations. *Master Naturalists* maintain their certification by volunteering 40 hours per year and obtaining 8 hours of advanced training to continue their life-long learning experience.

Master Naturalists have volunteered in a number of different capacities in 2019. For example:
-   Over 1,000 citizen science hours were reported from 56 Master Naturalists in 34 counties related to Snapshot Wisconsin, a Wisconsin Department of Natural Resources project in which volunteers monitor trail cameras on public and private lands and analyze photos to identify wildlife.
-   Master Naturalists invested close to 5,000 hours in 2019 for bird monitoring activities (Christmas bird counts, eagle nest monitoring, Midwest Crane Count etc). This time-intensive service provides scientists and conservationists with statistical data that is crucial in detecting problems in bird populations.
-   Master Naturalists provided more than 1,800 hours of service maintaining and expanding nature trails on 35 different sites across 22 counties. This work ensures that nature trails can be enjoyed by Wisconsin residents in a manner that is safe both for people and the natural environment.

| 9. | The Role of Colonic Polyphenol Metabolism Anti-Inflammatory Activity of Aronia Berries | Issue: The Centers for Disease Control and Prevention estimates that more than 3 million Americans reported being diagnosed with inflammatory bowel disease (IBD), a broad label for chronic gastrointestinal inflammation. The most common types of IBD include Crohn's disease and ulcerative colitis, with symptoms such as abdominal pain, diarrhea, weight loss and fatigue. There is evidence suggesting diet may contribute to the start of the inflammation, while the roles of genetic and environmental risk factors are more complex. There is consensus, however, that immune system dysfunction is responsible for IBD at the onset. Because many with IBD are diagnosed early in their lives (between the ages of 15 and 35), the discovery of dietary or lifestyle changes to prevent, delay the onset, or reduce the severity of IBD could bring relief to millions of Americans who live with their diagnosis for decades.

What has been done/Results: Knowing that increased consumption of colorful fruits rich in polyphenols is associated with reduced risk of IBD, researchers at the University of Wisconsin–Madison used mice and cultured immune system cells, called T cells, to learn if and how aronia berries (chokeberries) could affect colon health and gut microbiota. Control groups of mice received a standard diet, while experimental groups received aronia-enriched diets equivalent to an adult human eating one cup of aronia berries daily. Researchers then attempted to induce inflammation in the colons of some mice through T-cell transfers to provoke an immune response, and chemically in others with dextran sodium sulfate. The mice were observed, their colons were dissected for examination, and their gut bacterial populations were analyzed. Researchers found — particularly in the mice receiving T-cell transfers — that aronia consumption stimulated the production of the anti-inflammatory protein IL-10, delayed onset and inhibited symptoms of colitis, prevented associated weight loss, and enhanced survival, though it did not completely prevent colitis. Aronia consumption also significantly increased the diversity of gut microbial communities, which is desirable.

Target audience/Impacts: Currently, aronia berry is not a widely grown crop in the United States, but interest is growing, particularly in the Midwest and Upper Plains where the bush grows particularly well. The berries' rich pigments and high | Nutrition |

		levels of potentially health-promoting polyphenol compounds are deserving of more research to understand how immune health is affected. With better understanding of these effects, specific nutritional recommendations could be developed to prevent or manage chronic diseases like IBD and other inflammatory conditions. Two peer-reviewed research papers have been published about these findings. The project resulted in one PhD dissertation, and provided training and professional development for two graduate students. Researchers presented data from this project and discussed aronia berries at an American Chemical Society national meeting. This research involved a collaboration of researchers in the Departments of Food Science and Bacteriology.	
10.	Supporting Wisconsin Food Entrepreneurship & Ensuring the Availability of Safe Food through Food Safety Training	The processing of fruits and vegetables is an important industry in Wisconsin. According to the 2015 Wisconsin Agricultural Statistics publication, Wisconsin ranked 2nd nationally in carrots grown for processing, 3rd in sweet corn, 3rd in green peas, 1st in snap beans, and 3rd in cucumbers harvested for pickling. These crops accounted for cash receipts of over $190 million for the state in 2015; thus, food safety is an important topic for small businesses across the state. In order to legally process and sell fruits and vegetables, entrepreneurs are required to receive training in how to produce safe food. By providing a variety of food safety trainings and science-based consulting, Extension supports Wisconsin entrepreneurship and helps ensure the production of safe food for all residents in the United States. Currently, the University of Wisconsin – Division of Extension offers food safety training and process support for fruit and vegetable processors across the upper Midwest. In 2019, specialists and faculty trained processors of low-acid canned foods (such as canned peas and canned corn) in the Food and Drug Administration (FDA) "Better Process Control School" course. Over 100 individuals representing more than 40 companies across the states of Minnesota, Iowa, Illinois, and Wisconsin were trained in safe canning of low-acid foods in the FDA BPCS curriculum. In the 16 exams administered in the course, the class average was 94.4, with participants mastering content in the microbiology of food processing, principles of acidified foods, principles of thermal processing, container handling, instrumentation, sanitation, record keeping, flexible	Food Safety

| | | packaging, closures for glass containers, the can double-seam, and retort operation.

In addition to the training focusing on low-acid canned foods, we developed a program for manufacturing acid and acidified foods – such as dessert sauces, fruit spreads, cucumber pickles and salsa. In 2019, we trained 110 individuals representing 54 small businesses from Wisconsin, Minnesota, and Illinois. In this one-day intensive training, processors learn how to develop a safe product, manage, and track production, and document product food-safety. There was an average score of 90 across the four exams administered at the training. Through this training and certification, we enable entrepreneurs to legally receive a license as a food manufacturer. Extension offers free one-on-one support for these food entrepreneurs in product development and serves as a process authority for many small businesses across the state. A total of 283 scheduled processes were developed for small businesses in the upper Midwest in 2019, covering nearly 400 new food products introduced into the marketplace by these businesses. | |
| | Supporting our Beef Industry in Producing Safer Wisconsin Beef | While the vast majority of American consumers are not farmers themselves and know very little about livestock production, they are increasingly concerned about food safety and animal welfare. Due to this trend, Wisconsin beef producers are seeking ways to ensure consumers that they are committed to producing high-quality, wholesome, and safe beef products.

In response, the Beef Quality Assurance (BQA) program was created in 1987 to help beef producers implement best management practices and new technologies. This helps to continuously improve beef quality, safety, and animal welfare. Tyson, Cargill, JBS, and other beef harvest facilities require their individual beef producers to have BQA certification, which in turn increases consumer confidence in the beef production and food safety.
To continue marketing finished cattle to harvest facilities requiring certification, beef producers are required to attend BQA training. To support producers, UW-Madison Division of Extension and the Wisconsin Beef Council partnered to organize and conduct over 50 workshops from 2018 through the end of 2019, reaching more than 1,800 producers. Educators conducted science-based training revolving around six topics: Using the Beef Check-off; Consumer Perception of Beef Production; Care and Husbandry Practices; Feedstuffs; Feed Additives and | Food Safety |

		Medications; and Injectable Animal Health Products. All topics were geared toward making the production environment safe for producers and their animals, and to subsequently ensure consumers that the meat they eat is safe to consume. Beef producers in attendance listed over 100 management practices they expected to add or change as a result of attending the workshop. The most commonly reported intended changes were to keep better records, use better vaccination techniques, and improve their cattle handling practices. All of these intended changes allow producers to produce safe, wholesome beef products with fewer bruises, injection site lesions, and residue concerns. In addition to the BQA workshop evaluation done by Extension educators, one of the Big Four Meatpackers where some Wisconsin cattle are harvested, publicly announced recent decreases in residue violations, carcass bruising, needle site injection lesions, and broken needles due to injections. We see this as an additional indicator that our BQA training makes Wisconsin beef products safer to produce and safer to consume.	
11.	Engaging Underrepresented Communities in STEM to Prepare them for Science-Based Jobs and to Diversify the STEM Labor Workforce	A strong set of math and science skills is a fundamental requirement for Wisconsin youth to succeed in competitive modern labor markets. This is especially important for minority groups traditionally underrepresented in STEM. Through the Research Accelerators program, Extension engages minority youth participants in STEM by creating activities that involve experimentation, discovery, and building solutions. By guiding students through scientific data collection, developing scientific questions, researching science topics, and presenting conclusions to their peers through participation in the *Science Strikes Back* science fair, students learn new skills while practicing them in context. Programs like this stimulate interest in STEM among Wisconsin youth and introduce them to professionals and peers also engaged in STEM, encouraging them to pursue these kinds of careers in the future. Research Accelerators are facilitated by Upham Woods staff for schools in the Milwaukee area and help prepare students for the Science Strikes Back community science fair in February each year, as well as for continued engagement in environmental STEM education in their community. In 2019, 488	Education and Science Literacy

students (ages 5-17) from 10 schools and 1 after-school program participated. The program was specifically designed for youth in the Milwaukee area, which is a diverse, but highly segregated part of the state. For example, depending on the school, the percentage of students who identify as Black or African-American ranges between 0 and 97 percent of the overall student body. Similarly, the student population identifying as American Indian or Alaska Native may range between 0 and 100 percent depending on the school. The students we worked with were representative of the diversity of the overall school population in our partnering schools. Nine members of Upham Woods staff and 14 teachers worked to facilitate the program.

Through partnerships in neighborhoods throughout the city, the Research Accelerators engage underrepresented and minority populations with high quality STEM learning experiences. Students study their urban surroundings using the data collected through Digital Observation Technology Skills (DOTS) kits, professional-grade data collection tools used in multiple settings and across time that encourage confidence in STEM skills and abilities and a deeper understanding of STEM concepts.

Youth participants then transition from their roles as investigators to roles as communicators as they engage in Scientific Storytelling to practice communicating about the data they've gathered. Scientific stories can take many forms, including written, oral, kinesthetic, theatrical, or graphic media. Digitized scientific stories lend themselves to social media sharing, allowing for different audiences beyond classrooms and schools, such as their local communities and businesses.

Finally, students use the data they've gathered, and the guidance received during Research Accelerators to present their projects at the Science Strikes back fair. In 2019, the fair was hosted at Escuela Verde School and focused on water and the scientific process to answer learner-driven questions. There were 35 projects, more than 175 attendees and nearly 40 members of the community serving as judges. Survey data revealed that over 94% of attendees said they learned something new as a result of the science fair.

| 12. | Supporting Farm Managers in Positioning themselves as Employers of Choice to Attract and Retain High-Quality, Local Talent | As farm businesses across our state grow in size and complexity, their workforces continue to grow and change as well. Today, Wisconsin's farmers manage a growing and diverse workforce that can consist of seasonal and/or year-round workers, family members and various non-family employees. At the same time, many agricultural and related sectors are experiencing worker shortages due to a number of possible factors. Wisconsin's workforce is approaching full employment, with an unemployment rate around 3% (U.S. Department of Labor, November 2019). Potential workers may be attracted to alternative sectors, and there may currently be less availability of migrant agricultural worker populations. Further, Extension's county stakeholders have indicated that Wisconsin's rural workforce is decreasing due to an aging population, in connection with a trend for young people to leave rural areas. In a recent study conducted by UW-Madison - Division of Extension, dairy managers identified employee turnover as the leading cost connected to human resources management. The Society for Human Resource Management estimates the average cost per new hire at over $4,000 per new hire. This makes employee turnover a significant cost and risk factor for Wisconsin farms, especially because the study indicates that employee turnover on dairy farms in Wisconsin is significantly higher than broader industry benchmarks.

By providing the groundwork to help them become better and more effective human resource managers, farm managers can become the employers of choice in today's very competitive labor market. In the long term, these skills help reduce costly employee turnover and retraining, improve safety through a well-trained and highly engaged workforce, and enhance profits through improved workforce efficiency and productivity. Through a combination of online-materials, one-on-one coaching, and workshops, Extension systematically helps farm leaders acquire the knowledge and skills needed to recruit, motivate, and retain quality people. Whether farms have numerous and significant needs in the areas of human resource management or just need to fine tune their existing practices: Extension provides professional training and support on a variety of topics that participants can choose from.

Currently our program portfolio covers conflict management, best practices in hiring, workforce motivation, training and on-boarding, techniques for providing effective feedback, and other topics. Extension educators across the state | Rural Prosperity |
|---|---|---|---|

		additionally utilize the learning materials we created for the program in their informal interactions with farm managers. This allows for greater reach of the program and ensures that farm managers can build the skills they need just-in-time, even if no workshops are currently offered in their county. In 2019, Extension educators and specialists offered professional development at no cost for farm owners/managers in five locations around the state. One of the workshops held was intended for a state-wide audience and served individuals from 15 counties. In 2019, our educators have had over 100 educational contacts with farm owners/managers through workshops, and in one-on-one sessions.	
		Retrospective pre-post evaluations indicate that participants have increased their knowledge in managing conflict by 57%. Further, retrospective pre-post evaluations indicate that participants have increased their knowledge of how to create a positive farm business culture by 51%. The educational approach of the Becoming an Employer of Choice program is grounded in best practices related to adult and professional learning. Our program aims to foster peer mentors and sustainable support networks in the agrobusiness community. In the workshops, we provide participants with opportunities to learn from each other's experiences, which additionally support our educators in identifying best practices and sticky issues from stakeholders on the ground. Through this program, Extension is fostering a network of program alumni with whom we check back in regular intervals. We organize calls where participants can check in with each other and learn about aspects that are working and/or emerging. This helps us in our core goal to empower farm managers and enables us to fine-tune our curriculum and support materials based on the experiences of participants.	
13.	Supporting rural residents in accessing critical financial reports to enhance their credit health.	With the increase in data breaches in recent years, it is important for adults to check their credit reports regularly to detect fraud and identity theft. This task can be more difficult in rural communities, where residents may have limited high-speed internet access. Extension responds to this through programs that inform participants of alternative access points via phone and mail. Extension educators help people in Wisconsin in quickly spotting incidents of fraud or inaccuracy in their credit reports. This in turn sets them up to gain better rates on credit cards, personal loans, small business loans, insurance rates, etc. - a significant determinant of one's quality of life. Extension's *Check Your Free Credit*	Rural Prosperity

		Report Campaign is one of many programs that our educators across the state use to build the financial capability of Wisconsin's residents. In the past five years, Extension specialists and educators have developed and implemented the *Check Your Free Credit Report Campaign*. Through this educational campaign, adults are encouraged to sign up for reminders to check their credit reports for free from each of the three credit bureaus (Equifax, Experian, and TransUnion). The campaign uses easy to remember dates - 2/2, 6/6, and 10/10 - to help participants make a plan for accessing their reports throughout the year. As a result of checking their credit, over 1,000 participants were educated to spot inaccuracies in their reports and identify steps to take to improve their credit. When first signing up for reminder emails, 68% of participants had not ordered a credit report in the past year. In a 2019 year-end follow-up survey completed by 206 participants, 36% ordered one new credit report and 37% ordered two or more reports. While the majority (83%) of those viewing their credit report found no errors or fraudulent activity, 6% contacted a creditor or credit bureau to fix an error, and 7% identified a way to improve their credit. Since the program's inception in 2013, more than 1,000 adults in 71 of Wisconsin's 72 counties have signed up to participate. In 2019 nine other states also adopted the program; 28 states have used our curriculum and approach since the start of the program.	
14.	Improving Oxidative Stability in Muscle Foods by Phospholipid Hydrolysis and Examination of the Mechanism Involved	Issue: Lipid oxidation is a major cause of the deterioration of quality in meat and fish. It can cause discoloration, off-odors and off-flavors. Additionally, there is some concern about health implications of lipid oxidation in foods. To stop oxidation, a number of antioxidant strategies have been employed. Antioxidants extracted from plants tend to be unstable during storage or change the color or other properties of the meat. Synthetic antioxidants, while more economical and practical, come with health concerns. Researchers, therefore, are looking for additional sources of natural antioxidants to address these issues. Phospholipases A2 (PLA2) are a group of naturally occurring enzymes that have been shown to have antioxidant effects in cod and other marine fish. The mechanism by which they work and their functions in other meats, however, are still unknown.	Wisconsin Competitive Program

What has been done/Results: Researchers at the University of Wisconsin–Madison aimed to understand how PLA2 was inhibiting oxidation, and thus optimize its use as an antioxidant in fish and other meats. They found that PLA2 is able to limit the interaction of hemoglobin with lipids and therefore decrease hemoglobin-mediated lipid oxidation. They measured the effects of PLA2 in meats beyond fish, including turkey, chicken and pork. The found varying results in the different meats with PLA2 inhibiting oxidation in cod and pork, and accelerating oxidation in turkey and chicken. The effects of PLA2 appear to be influenced by a number of factors in meats such as muscle type, pH, heme content and free fatty acids.

Researchers took these findings further and assessed the success of PLA2 and rosemary as an antioxidant system in meats. They found that the combination provided a higher quality pork sausage than rosemary alone in both seasoned and unseasoned sausage. Conversely, they found that PLA2 and rosemary did not act as antioxidants in ground turkey. They hypothesized that there are some characteristics specific to poultry muscle that prevents PLA2 from acting as an antioxidant.

Target audience/Impacts:
The investigator of this project has interacted with multiple meat industry contacts about the findings of this project, and three partners facilitated pilot plant trials at their sites. The research has also been reported at four national scientific meetings and in a food science course at UW–Madison. Two manuscripts stemming from this work have been published, and additional manuscripts are being prepared. Two graduate students were trained on this grant, and another conducted work in the topic area. A patent was also filed due to findings of this project.