

2019 Annual Report of Accomplishments and Results

IOWA
Iowa State University
Combined Research and Extension Accomplishments and Results

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)
See POW

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
<p>1. The <u>Merit Review Process</u></p>	<p>ISU Extension and Outreach continued to monitor and adjust the plan of work through use of self-directed work teams, continuous needs assessment, and ongoing work with public and private partnerships. At the state level, state staff worked closely with key statewide constituencies. At approximately five-year intervals, a comprehensive state-wide needs assessment is completed to inform the plan of work for coming years. Assessment of needs were done at both the local and state level to inform selected plans. Iowa County Extension Councils and local stakeholder groups annually review and prioritize needs, feeding the information back to the statewide plan of work teams. Program leaders monitor feedback from stakeholders in the above reporting mechanisms as well as through departmental reviews, program evaluation by Plan of Work teams and program evaluation as part of externally funded projects, and work with team leaders to make necessary course corrections. North Central Regional Program Directors provide periodic oversight, guidance, and course corrections on logic models and joint program implementation and evaluation.</p>
<p>2. The <u>Scientific Peer Review Process</u></p>	<p>No updates to report... Scientific Peer Review: Project Proposals: Each project proposal is endorsed by the department chair and Associate Director of the Experiment Station. Each proposal is sent to peers internal to Iowa State University (typically 2 to 4 faculty at Iowa State University) for a thorough review of the scientific merit. Depending upon the reviews, the project is either approved, revised based on reviewer comments, or rejected.</p>

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
<p>1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation</p>	<p>Hired Dr. Tera Jordan and project team members to lead a comprehensive needs assessment of underserved Iowans in Linn County. Tera Jordan is the Assistant Provost for Faculty Development at Iowa State University. She is responsible for supporting the ongoing development of programs and policies that increase faculty success at Iowa State. These efforts include, but are not limited to, providing leadership for ISU ADVANCE initiatives and diversifying the faculty pipeline. She is an Associate Professor of Human Development and Family Studies. In research, she practices engaged scholarship to connect with underrepresented families and study contemporary issues in family health and well-being. Focusing on underserved groups will advance Iowa State University Extension and Outreach’s mission and vision to engage all Iowans in building a stronger Iowa, preparing for a thriving future, and solving contemporary problems in research, education, and extension.</p>
<p>2. Methods to identify individuals and groups and brief explanation.</p>	<p>Dr. Jordan collaborated closely with the ISU Extension and Outreach Leadership Team to identify target populations ISU Extension and Outreach has traditionally underserved. These groups included racial/ethnic groups, veterans, LGBTQA, youth, and immigrants. In addition to listening to ISU Extension and Outreach staff, Dr. Jordan communicated with relevant campus offices (e.g., Office of the Vice President for Diversity and Inclusion, Veterans Center, Center for LGBTQIA+ Student Success) and Iowa State University faculty and staff. The project team also conducted online searches of newspaper and media to find community partners in Linn County to engage.</p>
<p>3. Methods for collecting stakeholder input and brief explanation.</p>	<p>To learn more about gaps in service delivery, community connections, and outreach, Dr. Jordan prioritized a list of key individuals. She contacted people identified via phone and/or email and introduced them to this project. Her goal was to find four strong community consultants (CC) who were connected to underserved groups in the county. These individuals were regarded as well-respected and available to collaborate on a three-month long project.</p> <p>CCs representing various underserved communities helped bridge known divides in extension and outreach service and reach and connect with local residents. For example, the CCs offered valuable</p>

	<p>knowledge about locale and place that extension and outreach staff would be unable to access without local partners from underserved groups.</p> <p>CCs planned an approach for recruiting 25 residents to participate in community conversations about ways to better engage with extension and outreach.</p>
<p>4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.</p>	<p>The ISU Extension and Outreach Leadership Team will review and take into consideration project stakeholders' input and determine appropriate changes in outreach efforts.</p> <p>Recommendations from the stakeholders included: 1.) Embed extension and outreach activities and outreach within other community resources with complementary missions. Use their social media platforms and radio to increase familiarity and engagement. 2.) Expand extension and outreach staff to reflect a broader range of identities and backgrounds. Individuals must have lived experience, be relatable, and be able to build strong relationships characterized by trust and commitment with the community. 3.) Ensure staff can effectively manage conflict that may undermine an inclusive and welcoming atmosphere. 4.) Cultivate programming across education, health, life skills, and expanding Internet access to reach underrepresented adults and youth in the county.</p>

IV. Planned Program Table of Contents – Brief summaries of PLANNED PROGRAMS from the 2017-2019 PLAN OF WORK

No.	Program Name in order of appearance
1.	<p>Community and Economic Development: Economic issues facing Iowa communities are numerous and include an aging workforce, influx of immigrants, and changing economic structures. A combination of factors such as aging infrastructure, including housing; resistance to additional taxation; depopulation; and lower population density are pushing small local governments' budgets to their limits. This is a program of research and outreach, providing technical assistance and working with communities to develop and implement strategies that address the needs and help to enhance the economic and social resilience of their communities.</p>
2.	<p>Expanding Human Potential: ISU Extension and Outreach educational programs, delivered in a variety of ways, help Iowans improve knowledge and change behavior to reduce negative consequences brought about by inequalities, a weak economy and labor market, and practices. Families across socioeconomic status and race/ethnicity will increase knowledge and develop skills to improve decision making related to caring for children and other family members, parenting effectively, supporting older adults, avoiding risky behaviors, and managing and maximizing financial resources.</p>
3.	<p>Food Security: Agricultural production and related up and down stream industries make up the single largest sector of Iowa's economy and is important to rural communities in the state. Technology development via scientific discovery, both basic and applied, is needed to improve the efficiency, safety and sustainability of food production. Adoption of new technologies and practices by farmers holds economic, environmental and social implications at the farm, community and market levels. Production, marketing and business skills are needed by farmers to effectively evaluate new opportunities and navigate emerging challenges. Iowa's changing climate, especially increased amounts of rainfall during rain events, also requires multi-disciplinary research to solve related agricultural problems. Our research, education, and extension will continue to provide a safe, sustainable, accessible, and affordable food supply for Iowa, the nation, and the world. Examples of research and extension project/program focuses within this critical issue include commercial agriculture production efficiencies and productivity; cropping systems research; meat sciences; improvements in animal nutrition; commercial food safety, security, and production; regional and local food production; production animal systems; and integrated pest management.</p>
4.	<p>Health and Well-Being (Includes food safety): Iowa is changing, with an increase in older adults and increased ethnic, racial and socioeconomic diversity. Iowans support working collaboratively with local, state and federal partners to impact public issues such as poverty, financial instability, economic development, support for older adults, quality of family relationships, and child and youth success academically, socially, and emotionally. Research and extension projects and programs will help families across socioeconomic status and</p>

	<p>ethnicity/race to increase knowledge and develop skills to improve decision making related to caring for children and other family members. Programs will be directed to professionals, volunteers, community leaders, individuals, and families through multiple delivery methods. Delivery methods include educational classes, workshops, study circles, action team meetings, discussions, online learning, one-on-one interventions, and telephone hotlines. Indirect delivery methods included public service announcements, social media, newsletters, radio/television media programs and websites. Much of the research in this program area is focused on ensuring safe food products for consumers and the safety of the agricultural workforce, as well as assessment of and strategies addressing emerging and ongoing health issues of Iowans.</p>
<p>5.</p>	<p>Natural Resources and Environmental Stewardship: Wise management of all natural resources, including water, soil, air, and other resources is needed to sustain our nation's ability to produce food, as well as support environmental goods and services and economic and social functions. Without attention to environmental goods and services, our quality of life would be greatly impacted. The focus areas of this program encompass all of the natural resources within the highly human modified agroecosystem. Proper stewardship of natural resources that provide the base inputs for modern agricultural production is foundational to sustaining the desired quantity and quality of food, feed, fiber, and biofuels and the natural environment. Research projects and extension programs under this critical issue are designed to advance the sustainability and conservation of air, water, soil, plant, minerals, and biodiversity in Iowa's agricultural, forest, and forage/grassland production systems. Examples of research and extension project/program focuses, which address this critical issue, include nutrient reduction strategies, adoption of best management and conservation practices, master conservation courses, manure application, and nitrogen use efficiency.</p>
<p>6.</p>	<p>Sustainable and Renewable Energy: Iowans need high-quality, unbiased and accurate information when making informed and sustainable energy choices. Research and Extension personnel have access to the Iowa State University BioCentury Research Farm, the first-in-the-nation integrated research and demonstration facility dedicated to biomass (lignocellulosic crops, crop residues, and grain) production and processing. It will accelerate innovation and production capacity associated with biobased fuels, chemicals, and products. Collaborations for developing sustainable technologies will provide solutions that pave the way to meet national energy, economic, and environmental directives. Key components are:</p> <ul style="list-style-type: none"> • Research that brings together scientific expertise to address biomass cropping systems, biofuel and bioproduct processing, logistics of biomass supply, and positive environmental effects such as nutrient recycling back to the land. • Facilities for educating future scientists, producers, and extension experts. • Outreach that demonstrates economic, social, and environmental viability of biorenewable energy and biobased products production to producers, manufacturers, policy makers, and the public. • Partnerships with companies that will work with Iowa State in collaborative research, development, and demonstration.

7.	<p>Youth Development: The Iowa 4-H Youth Development Program empowers youth to reach their full potential through youth/adult partnerships and research-based experiences. Youth development outcomes, such as effective leaders, continue to be a high priority of stakeholders within and across Iowa's 99 counties.</p> <p>Through longitudinal youth development research (Lerner et al, 2012), data show positive youth development educational experiences help young people become competent, confident, connected, contributing, and caring citizens with character through a series of progressive learning experiences with caring adults. These experiences involve meeting the four needs of youth (Brendtro et al, 1992), fostering the eight essential elements (4-H National Headquarters, 2001) and, in Iowa, achieving the outcomes of effective leadership, productive citizenship, outstanding communication, and successful learning. These outcomes are reached through the Iowa 4-H program priorities of healthy living, STEM, citizenship and leadership, and communication and the arts.</p> <p>ISU Extension and Outreach 4-H Youth Program Specialists and county/regional Extension youth staff will work with diverse children, youth, families, volunteers, and youth-serving professionals to plan, implement and evaluate short-term and long-term educational programs and experiences that work toward the attainment of multiple life skill outcomes.</p>

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.	Direct technical assistance for Iowa small businesses	<p>ISSUE: Successful small businesses are the backbone of Iowa’s economy. Iowa communities have a great need to grow more businesses. ISU Extension and Outreach makes efforts to help the Iowa economy prosper and grow – enhancing the health of communities, growing businesses, and increasing the wealth and the quality of life for all Iowans.</p> <p>WHAT WAS DONE: Our Enterprise Development Team provided direct technical assistance towards 16 local businesses from sectors of agriculture, manufacturing, technology, and food production. The technical assistance we provided to the businesses included financial benchmarking, business plan development, financial projections, technology resources, and market analysis.</p> <p>IMPACT/OUTCOME: Our technical assistance during this program year supported our clients in acquiring more than \$2 million in loan funding and retention or creation of at least 94 jobs.</p>	Community and Economic Development (1)
2.	Business assistance and entrepreneurship development	<p>ISSUE: The overall health of Iowa’s rural communities is vital to the long-term success of the state. In order for rural Iowa communities to thrive, they must be attractive targets for investment by the private sector. Local leadership should be effectively developed, must strategically plan, and must set a vision to make Iowa an attractive place to live and work.</p> <p>WHAT WAS DONE: ISU Community and Economic Development (CED) specialists worked with small business owners and entrepreneurs to start or strengthen their businesses, to assist them with writing business plans and navigating the business permit process. Extension CED piloted the revamped Iowa Retail Initiative in for 44 business leaders in 11 communities. CED continued the Northeast Iowa Business Network Workforce Attraction Study to learn of the barriers to, and opportunities for attracting a vibrant workforce to the six-county study region. CED developed a professional guide training curriculum and workbook for staff and volunteers who lead guided</p>	Community and Economic Development (1)

		<p>programs at Iowa’s tourism attractions, including museums, nature areas, agritourism, and historic sites. The training was piloted with staff and volunteers from 61 tourism organizations in 35 Iowa cities. Of the 155 workshop participants, 42 individuals completed additional certification requirements.</p> <p>IMPACT/OUTCOME: In 2019, 193 jobs were created and 54 retained within the businesses with which CED specialists worked. The estimated value of the jobs created is \$11,503,935. A total of 37 businesses were started and 21 expanded with help from CED. Of those, 9 were minority entrepreneurs. CED specialists trained 251 business leaders/entrepreneurs. 150 of the new jobs are for a new sports complex in the Cedar Rapids Wapsi Recreational Byway area. It is estimated, that upon completion, this facility will host well over 50,000 participants and spectators every year, creating an economic impact of over \$6M annually to the region.</p>	
<p>3.</p>	<p>Helping school districts to establish farm to school programs</p>	<p>ISSUE: The USDA recommends a minimum of 0.5 to 1 cup per day of fruits and 0.75 to 1 cup per day of vegetables for each child. Schools’ purchase of fruits and vegetables from local farmers will increase freshness and nutrition content for Iowa children. In addition, farm to school programs provide market opportunities and profitability for Iowa farmers. But only about a third of Iowa’s school districts participate in farm to school activities. There’s much room to grow local procurement in Iowa.</p> <p>WHAT WAS DONE: The Farm, Food, and Enterprise Development Program provided technical assistance and incentives to 11 schools (from 10 districts) to explore barriers and find solutions to access local food procurement.</p> <p>IMPACT/OUTCOME: Out of the 10 districts, 8 districts set local food procurement goals; 9 districts set definitions of “local”; 7 districts established their farm to school work team. With the help offered by our program, 7 districts started to purchase products from local food hubs; 6 districts met or surpassed the project goal to increase their local food procurement at least by 10%. The new farm to school activities created by the program accounted for a total of \$14,132 local food purchases that supported the local farm economy. The program has served 25,000 students from the participating school districts and increased the students’ access to fresh vegetables and fruits.</p>	<p>Community and Economic Development (1)</p>

<p>4.</p>	<p>Risk management for agritourism</p>	<p>ISSUE: There are about 350 farms in Iowa offer some form of agritourism as part of their operation. Adding an agritourism segment to an existing farm can create additional economic values. However, numerous risks may arise when farms open for the public to visit. For instance, just one illness or injury linked to an agritourism destination could be catastrophic to not only the injured party but to the entire farm and the families. Although agritourism is growing in Iowa, no injury or illness prevention activities were available for this business segment.</p> <p>WHAT WAS DONE: The Farm, Food and Enterprise Development, provided three “Visit Iowa Farms” workshops across Iowa focused on agritourism destination safety and health best practices. The workshops covered six topics: 1) Food safety best practices, 2) legal risk in agritourism, 3) public play areas safety, 4) pesticide safety for agritourism destinations, 5) protecting animals and humans from biosecurity risks, and 6) farm emergency preparedness and planning. There were 81 people who attended the workshop.</p> <p>IMPACT/OUTCOME: The workshops educated farmers on risk management practices related to agritourism. The workshops increased participants’ knowledge level between 38% to 64% dependent on specific topics. Between 39% and 64% of participants indicated they would “definitely” implement a safety or health intervention at their operation within the following 3-6 months. The 6-month follow-up survey showed 73% of participants indicated they had implemented a new practice learned from the workshop. The implemented new practices included handwashing signage and practices for visitors, installing a tornado shelter, logging pesticides, and planning for severe weather. These improvements reduce the risk for operators and keep visitors safer while enjoying agritourism destinations.</p>	<p>Community and Economic Development (1)</p>
<p>5.</p>	<p>Training child care professionals in early childhood education</p>	<p>ISSUE: Seventy-five percent of Iowa parents with children under age 6 are working. Parents have a high demand for quality early childhood programs. Early childhood education is critically important for children to develop their full potential and shape key academic, social, and cognitive skills that determine their success. However, due to limited financial resources and high job turnover rates, most child care professionals have limited training in early childhood education.</p> <p>WHAT WAS DONE: Multiple professional development and training programs were developed and delivered to child care professionals to meet training needs for early childhood education. (1) I-Learn Early Childhood Education (ECE) Online programs were developed to provide training in the area of health and safety practices. (2) Early Childhood Environment Rating Scale (ERS) classes provided a self-assessment, instruction, and guidance in developing an improvement plan</p>	<p>Expanding Human Potential (2)</p>

		<p>to strengthen program quality with the option of a follow-up formal assessment. (3) The New Staff Orientation (NSO) program provided 16 hours of instruction for child care center staff and program directors. (4) Child Care Resource and Referral consultants participated in a consultant credential and mentor credential program. 207 child care provider workshops on early learning topics were conducted in counties across Iowa. (5) Early Childhood Websites and Family Child Care Environmental Rating Scale Pinterest Social Media sites supported training.</p> <p>IMPACT/OUTCOME: A total of 40,611 professional participants reported individual and program improvements. 11,409 online participants successfully demonstrated knowledge gains in health, safety, and child development. 423 teachers and 47 directors participated in the NSO program and completed portfolios with significant gains in each of the 11 NSO outcomes. 458 Environment Rating Scale participants completed self-assessments and initiated program improvement plans. 94% of participants indicated the program helped them better identify strengths and limitations, prioritize changes, and had initiated a workable plan for program improvement. Environment Rating Scale assessments were conducted to document the quality (i.e. learning spaces and furnishings, personal care routines, educational activities, etc.) of 231 child care classrooms. In the I-Consult program, 41 early childhood education consultants learned and demonstrated skills in coaching and consultation and 8 consultants earned an I-Consult credential. An additional 4,296 early childhood professionals participated in the child care community and online workshops. 94% participants reported or demonstrated improving learning environments or teaching practice.</p>	
6.	Powerful tools for caregivers	<p>ISSUE: In the U.S., there are 43.5 million family caregivers who help care for an adult with chronic conditions. They provide a vast array of services (e.g., emotional, financial, nursing, homemaking) on a daily or intermittent basis. However, caregivers may face three challenges: physical strain, emotional stress, and financial hardship.</p> <p>WHAT WAS DONE: Iowa State University Extension and Outreach trained 10 new class leaders to co-lead Powerful Tools for Caregivers programs (PTC) in their communities. Powerful Tools for Caregivers is a series of six classes designed to empower family caregivers to take better care of themselves, so they can thrive, not just survive. The newly trained class leaders joined a team of more than 100 class leaders prepared to deliver the program throughout Iowa. Currently, the program has been delivered to two target audiences: caregivers of adults with chronic conditions and caregivers of children with special health and behavioral needs. The online PTC program is being pilot tested.</p>	Expanding Human Potential (2)

		<p>IMPACT/OUTCOME: 55 family caregivers participated in Powerful Tools for Caregivers series. 100% of the caregivers who completed the evaluation survey (n= 52) reported increased self-care practices (increased exercise, use of relaxation techniques, health self-care) and increased mastery over the caregiving tasks after participation. They also increased self-confidence in their caregiver roles. The participants indicated increased knowledge of resources and how to access them. Improved self-care practices by family caregivers lead to reduced reliance by caregivers on health care and public services.</p>	
7.	<p>“Making Ends Meet” financial education workshop</p>	<p>ISSUE: An increasingly complex marketplace, income constraints, rising costs of living and the dynamics of family life have created financial challenges for individuals and families. Failure to set financial goals leads to impulsive or unwise decisions, poor management of scarce resources, increased pressure, and high social and economic costs for families and society.</p> <p>WHAT WAS DONE: We developed a series of two-part “Making Ends Meet” workshops to help low- and moderate-income individuals identify resources to supplement current income and foster achievement of specific financial goals. We delivered 10 sessions of the workshops to different populations in Iowa.</p> <p>Workshops targeting caregivers helped participants make plans for financing care of older family members. Workshops on retirement planning facilitated the development of plans for income withdrawals during retirement and helped public employees better understand the coordination of public pension income with other sources of retirement income. A blended course for Iowa public library staff and K-12 educators helped participants achieve goals related to basic financial planning practices, insurance, investing, and retirement planning. A wide range of additional financial management workshops targeted specific audiences (e.g., new immigrants, people who are homeless or in prison, members of the Meskawki Native American tribe, participants in ELL programs, and individuals with disabilities in group homes) and helped these Iowans achieve their financial goals.</p> <p>IMPACT/OUTCOME: 75% of the workshop participants (N=645) reported making progress toward at least one financial goal. This series of workshops changed the financial management behavior of different audiences. Specifically, participants in basic money management workshops reported tracking spending and setting up a budget. Caregiving workshop participants reported organizing financial records, securing legal documents for needed care decisions, and making</p>	<p>Expanding Human Potential (2)</p>

		<p>plans to cover long-term care expenses. Participants in retirement planning workshops indicated taking steps to make financial plans for a secure retirement. Participants in the blended course for public educators and library staff reported taking specific actions to achieve a wide range of financial goals related to basic financial planning, insurance, investing, and retirement planning. Having the audiences set specific their financial goals can help individuals and families achieve satisfaction and high levels of economic well-being.</p>	
<p>8.</p>	<p>Financial education professional development for teachers, librarians, tax volunteers, and social workers</p>	<p>ISSUE: Studies suggest that integration of financial education into social service programs can be more effective than stand-alone educational offerings. Iowa mandates K-12 financial literacy education but provides no systematic professional development for educators responsible for this subject matter. Public libraries are often viewed as trusted, safe, and unbiased resources, but research shows that librarians report a need for additional training and resources on personal finance. To better serve families from low or moderate-income communities, social service workers and Volunteer Income Tax Assistant (VITA) volunteers also have a need to increase their knowledge, skills of family financial management, and access more resources.</p> <p>WHAT WAS DONE: 30 Small Change workshops were offered to Iowa K-12 educators and to public library staff. The blended course focused on building their personal financial management skills and connecting these professionals with vetted curricula, web-based resources, and model programs. With support from a FINRA Investor Education grant, public library staff were able to request vetted financial literacy books to supplement their library collection and each participant developed a plan for a library financial literacy program. At the same time, to help VITA volunteers and social service workers better assist community members with financial management concerns, we offered the volunteers and service workers 6-hour training: Your Money, Your Goals workshops. The workshop covered financial management issues such as smart goals, spending plans, saving money, credit management, getting organized, and community resources. The workshop also supported VITA volunteers to successfully complete the education and testing required by the Internal Revenue Service (IRS).</p> <p>IMPACT/OUTCOME: For the Small Change workshops, 593 teachers and librarians participated in a month-long blended course involving a 2-hour workshop followed by four weeks of game-based online learning. 66% who completed pre-, post- and 3-month post-surveys (307 of 468) reported being better prepared to identify and use trustworthy financial literacy resources in their work with library patrons and students. Educators received license renewal credit for completion</p>	<p>Expanding Human Potential (2)</p>

		<p>of coursework that required building understanding of new state financial literacy content standards for K-12 students and critiquing curricula. As a result of the Your Money Your Goals workshops, 70 VITA, volunteers successfully completed IRS certification exams and completed 1,741 tax returns, which yielded \$742,651 of Earned Income Tax Credit (EITC) refunds. VITA's free tax preparation helps Iowans with low and moderate incomes avoid commercial tax preparation fees and secure sizable EITC refunds that supplement low-wage work and circulate in the local economy. 62 community-based agency personnel and volunteers completed the workshop. Half of the participants (11 of 21) who completed a post-workshop survey reported being better prepared to work with clients on financial management issues.</p>	
9.	<p>Consultation services for producers in response to emerging crop issues.</p>	<p>ISSUE: In the 2019 growing season, farmers experienced a large influx of a relatively unusual insect to Iowa crop fields: thistle caterpillars. While this insect is not rare in Iowa crop fields, injury is typically minimal. Consequently, little information about its life cycle, feeding habits, and the threat to crops are available at the farmer and farm advisor level. Farmers had a great need for more information on thistle caterpillars, foliar injury to soybeans, and economic thresholds for this feeding.</p> <p>WHAT WAS DONE: Field agronomists and an extension entomologist provided technical support to help farmers and crop advisors evaluate and estimate the insects' feeding injury on crops, assess economic thresholds, and decide appropriate treatments of pests. The support was carried out by social media alerts, newsletters, phone calls, and field calls.</p> <p>IMPACT/OUTCOME: Through this service, 90% of participants found sufficient information to make a treatment decision, 62% of participants confirmed crop injury from thistle caterpillars, and 62% of participants determined the amount of injury. The services helped to control the pest on at least 70,000 acres of soybean fields. Served farmers estimated this service increased \$11-\$15 per acre economic value, which resulted in \$700,000 to \$1,000,000 additional economic value output. This service not only helped farmers' profitability, but also benefited food security for the nation.</p>	<p>Food Security (3)</p>
10.	<p>Advanced calving clinics</p>	<p>ISSUE: Calf death has caused significant economic loss to the beef and dairy industry, with nationwide losses of \$668 million and Iowa losses of \$41 million. In Iowa, about 20% of calf death is due to calving related issues. To increase the percentage of calves that survive to weaning, farmers need to learn how to properly manage heifers and cows and the risk associated with birth and the first few weeks of life.</p>	<p>Food Security (3)</p>

		<p>WHAT WAS DONE: Three advanced calving clinics were hosted in northeast Iowa that covered topics including cow nutrition and neonatal calf health care. The clinics also incorporated two hands-on sessions on dystocia and first aid. 184 producers, 38 college students, and 17 4-H youth members attended the clinics.</p> <p>IMPACT/OUTCOME: Participation in the clinics increased 30% (n=55) of participants' knowledge regarding the late gestation/early lactation nutrition; 28% (n=52) of participants' knowledge regarding neonatal calf care; 29% (n=53) of participants' knowledge regarding calving dystocia; 28% (n=52) of participants' knowledge regarding first aid. Participants developed skills in vaccination timing, colostrum management, dystocia management, esophageal feeding of newborn calves, and how to apply and use obstetric chains properly. By implementing the knowledge and skills learned through the calving clinics, it is estimated farmers will lower the calf mortality rate by 30%.</p>	
<p>11.</p>	<p>Incorporate FieldWatch® and the protection of non-target organisms (bees and other pollinators) components into the Commercial Pesticide Applicator Training.</p>	<p>ISSUE: Bees are important to many Iowans. The pollination services of bees are essential to the production of many specialty crops and help to increase soybeans yield. Honey production in Iowa totaled 1.86 million pounds and the honey crop valued at \$4.38 million in 2018. However, bees and other pollinators are threatened by the indiscriminate use of pesticides. Therefore, it is critical for all pesticide applicators in Iowa to learn how to protect pollinators better.</p> <p>WHAT WAS DONE: ISU Extension Pesticide Safety Education Program (PSEP) incorporated into the commercial pesticide applicator training the protection of non-target organisms (bees and other pollinators) and instructions on how to use FieldWatch®. FieldWatch® is an online mapping registry intended to enhance communication among producers of specialty crops, beekeepers, and pesticide applicators. The program trained 13,831 private applicators in the sessions of 2018-2019.</p> <p>IMPACT/OUTCOME: Of the 5,756 participants who completed a post-program survey, 95% (5468) indicated their participation increased their knowledge of FieldWatch®. 48% of respondents, or 2,701 participants, indicated they started checking FieldWatch® or communicated directly with beekeepers in their area if they were going to use pesticides toxic to bees. Improved communication between pesticide applicators and beekeepers will help protect more bees and other pollinators from pesticide toxicity, thereby improving local crop production and enhancing the honey industry.</p>	<p>Food Security (3)</p>

<p>12.</p>	<p>Grain and livestock marketing education</p>	<p>ISSUE: Iowa’s value of sales for grains and oilseeds fell by 5.9% from 2012 to 2017, resulting in an overall decline in net farm income. Iowan farmers faced critical challenges in marketing crops. Farmers need further education to develop their marketing plan based on the nuances of market cycles.</p> <p>WHAT WAS DONE: We hosted two series of statewide meetings (Pro-Ag Outlook program and GrowingOn) focused on grain and livestock marketing, issues impacting international trade, and tax changes in Section 199A deductions for 3872 Iowan grain and livestock producers. We also developed and delivered hands-on sessions for the Women Marketing Grain group and other small group marketing clubs in the meetings. In addition to in-person programming, marketing videos and an online marketing simulation were incorporated as a complement to the traditional meetings.</p> <p>IMPACT/OUTCOME: For GrowingOn meetings, 99% of the participants saw a positive impact on their operation if they applied one or more concepts they learned from the seminar. 50% of participants of the Pro-Ag Outlook meetings increased knowledge in grain market outlook. 70% of the participants from the Women Marketing Grain group increased their knowledge in carrying costs of storing corn or soybeans beyond harvest. The program changed 42% to 50% of the participants’ behaviors, including calculating their breakeven price, discussing marketing goals with family or farm partners, and making decisions about post-harvest strategies. Nearly 5,000 people watched the marketing videos. By increasing farmers’ knowledge of grain and livestock marketing, this program will help farmers to achieve their marketing goals and improve their net farm income. Farmers with enhanced marketing skills also help to strengthen the local farm economy in Iowa.</p>	<p>Food Security (3)</p>
<p>13.</p>	<p>Iowa Beef Center beef cow management strategies program</p>	<p>ISSUE: Sustainable beef cow production in Iowa is becoming increasingly critical as Iowa grows its fed cattle industry and other beef markets while looking for alternative land use on fragile acres prone to soil erosion. Iowa is home to 4.2 percent of the United States beef cattle inventory, the seventh-largest number of any state in the country. As of January 1, 2018, Iowa had the tenth largest beef cow herd with 970,000 cows. However, land use in Iowa has changed dramatically since 1997, with approximately two million fewer acres in cropland pasture and associated losses in hay production (88% loss), while beef cow numbers in the state have declined only 14 percent. As Iowa beef producers strive to raise more cattle on fewer acres, producers look for alternative management strategies to be employed.</p>	<p>Food Security (3)</p>

		<p>WHAT WAS DONE: From 2015-2018, the Iowa Beef Center partnered with 28 producers to assess emerging beef cow management technologies, detail benchmarks, summarize production and environmental data, and develop decision tools. This three-year project identified costs, environmental impacts, and best practices from Iowa cow-calf operations based on three production systems: traditional grazing; extensive grazing; or limited or no grazing. Findings of this project were disseminated through 3 bus tours, 4 regional beef conferences, and 4 workshops. 83 producers attended the program release meetings and 284 participants attended at least one of these events.</p> <p>IMPACT/OUTCOME: This program helped farmers to identify and implement appropriate alternative management strategies for their livestock operation. Specifically, 60% of participants reported they improved their pasture management, 43% added cover crops, 33% started grazing hay fields all to extend the grazing season, 28% purchased additional pasture land, 24% changed their residue management to extend the grazing season, 22% shifted their calving season, 8% moved part of the herd to a drylot, and 3% each built a confined building for part of the herd or built a confined barn for the calving season. 26% plan to implement a new cow system, 40% plan to expand cow numbers and 11% plan to decrease cow herd size in the next five years. 10% of respondents used the budget model and 44% planned to in the future. Participants stated that the average economic return to participating in the program was \$16.46 USD per cow. The total economic impact created by the program was estimated to be between \$158,674 and \$579,655.</p>	
<p>14.</p>	<p>Ration balancing assistance services for Iowa beef producers</p>	<p>ISSUE: Adequate and balanced nutrition is critical for health, performance, and efficiency of beef operation. Proper nutrition can greatly affect reproductive performance of the cow herd and performance and gain of feedlot cattle. However, feed costs are the greatest cash costs in beef production, accounting for approximately half of total costs of cow herds and representing one of the greatest costs for feedlot operations. Producers look for proper ration balancing and alternative feeds for the least cost nutrients.</p> <p>WHAT WAS DONE: ISU Extension and Outreach beef specialists provided individual ration balancing assistance to 113 producers who, on the average, raise 137 head of beef cow/calves per producer.</p> <p>IMPACT/OUTCOME: The services our program provided have helped local livestock producers in finding the appropriate ration balancing and lowering the feeding cost. 100% of the participants indicated the service accurately predicted the intake of their cattle, and that they were satisfied</p>	<p>Food Security (3)</p>

		<p>with the performance of the cattle on the ration provided. This service helped 46% of participants maintain or improve their livestock’s body condition; improved 25% of participants’ cattle health condition; increased the livestock’s average daily gains for 18% of participants; improved 7% of participants’ animal carcass quality in their feedlot cattle; reduced the feed costs for 50% of participants; helped 50% of participants stretch their feed supplies; and helped 21% of respondents switch to less expensive feedstuffs. Also, 14% of participants started utilizing a nutritionist to formulate rations and 12% began using the ISU Beef Ration and Nutrition Decisions Software (BRaNDS) program.</p>	
<p>15.</p>	<p>Agricultural lender seminars</p>	<p>ISSUE: Iowa’s rural areas with strong dairy communities have identifiable economic impact of over \$4 billion per year. However, profit margins of dairy operation have dwindled during the past five years. Farmers experienced both economic and personal stress.</p> <p>WHAT WAS DONE: The ISU Extension and Outreach Dairy Team developed and delivered two annual seminars for agricultural lenders. The seminars covered topics including 1) dairy marketing and risk management; 2) farm mental health and grief; 3) convergence of the big three in lending, economy, technology and experience; 4) new tax law changes; 5) grain and livestock marketing and risk; 6) dairy enterprise resiliency; 7) accrual accounting benefits to dairy enterprises. The northeast Iowa seminar (in existence for 31 years) provided instruction to 183 agricultural lenders from 54 banks and other businesses represented. The northwest Iowa seminar (Siouxland Agricultural Lenders, in its third year) instructed 71 agricultural landers from 34 banks and other businesses represented.</p> <p>IMPACT/OUTCOME: Ninety-nine percent of northeast Iowa seminar attendees rated the program as having high value. On average, this seminar increased attendees’ knowledge level of all topic areas by 15%. For the northwest Iowa seminar, 100% of attendees were satisfied with the program and helpfulness of information. This seminar averagely increased attendees’ level of knowledge in all topic areas by 19%. 90% of lender attendees planned to recommend at least one topic they learned from the seminar to their clients. 96.4% anticipated a benefit as a direct result of this learning activity, and they estimated aggregated benefit to their clients was \$35,178. By supplying the most current information and research to agricultural lenders, agricultural lenders will be able to provide producers with critical farm loans risk management information and protect assets for the banks as well.</p>	<p>Food Security (3)</p>

<p>16.</p>	<p>Iowa Pork Industry Center biosecurity training</p>	<p>ISSUE: Iowa is the #1 pork producing state with an annual production of 50 million hogs. State swine production creates approximately 165,000 jobs and generates around 11.7 billion dollars of economic activity (GDP). To enhance the animal welfare and boost the pork industry, producers look for information about biosecurity</p> <p>WHAT WAS DONE: The swine extension specialists from ISU Iowa Pork Industry Center, partnered with the Iowa Pork Producers Association and other allied industry partners, to develop and deliver 14 hands-on biosecurity trainings to pork producers throughout the state. These workshops taught how to minimize common biosecurity mistakes using simple germ simulation dust (GloGerm) as a hands-on learning activity. There were 355 swine producers who attended the workshops</p> <p>IMPACT/OUTCOME: 19 participants completed a 6-month post-workshop survey, or indicated they had changed, or planned to change, 46 practices related to biosecurity, such as using clean/dirty line technology and entry benches, developing Secure Pork Supply plans, and implementing a biosecurity manager. Participants indicated the workshops helped them understand the importance of biosecurity, track pathogens, and become more aware of foot traffic. On average, each participant who completed the survey estimated the workshop helped save them \$6,361. If all 350 participants achieved similar results, the total economic value of the program could be estimated at over \$2.2 million dollars.</p>	<p>Food Security (3)</p>
<p>17.</p>	<p>Quality and safety of meat and poultry products</p>	<p>ISSUE: This project focuses on improving the quality and safety of American meat and poultry products, providing U.S. consumers with safer products and helping Iowa to maintain our major role in International markets.</p> <p>WHAT WAS DONE: We conducted studies to understand and define physiological pathways and biochemical determinants of fresh meat quality; we studied current methods used to predict fresh beef and pork quality; we researched the antimicrobial effectiveness of nonmeat ingredients and processing technologies; and a systematic review of microbiological interventions was undertaken to evaluate the impact of these interventions on salmonellae.</p> <p>IMPACT/OUTCOME: Overall, the research from this project has contributed substantially to enhancing the safety and quality of meat. The project has contributed to our fundamental understanding of the changes in the chemistry of muscle during cooling, and how these changes can impact the overall quality of the meat, as perceived by the consumer. This work has also contributed to correlating various objective measures with muscle quality, which allows for a</p>	<p>Food Security (3)</p>

		<p>better comparison of the results of different methods of analysis on the quality of the meat. A new technology, which involves the inclusion of specific processing aids into the package was evaluated. Our results will help the industry determine the potential and limits of the new technology, which ultimately may benefit the consumer in higher quality processed meats with a longer usable shelf life.</p>	
<p>18.</p>	<p>Interaction of cropping systems with their environment in the central United States</p>	<p>ISSUE: Variability of precipitation and temperature is one of the main reasons for year-to-year fluctuations of agricultural yields. Actionable information on variability of surface weather elements is necessary to inform policy decisions regarding adaptation and resilience of agricultural systems in a changing world. The central U.S. poses special challenges in this regard, since not only does climate affect agricultural and other human-managed systems, but human activities also affect regional climate. The need to manage the impact of these variations leads to human modifications of the landscape such as the adoption of tile drainage or irrigation.</p> <p>The landscape in the intensively managed agricultural regions of the Midwest and Great Plains is also being modified by the rapid build-out of wind farms. Turbine-generated changes in mean wind, pressure, and turbulence alter fluxes of heat, moisture, and CO₂ are of vital importance to biophysical crop processes. Research is needed to provide decision-relevant information on the interactions of climate and land use changes for agricultural systems in this region. Such information is essential not only to determine the continued viability of Iowa's present agricultural system, but also to determine a range of future adaptive agricultural strategies.</p> <p>WHAT WAS DONE: We have been combining information from field experiments and satellite remote sensing with computational models of agro-ecosystems. In this reporting period we completed analyses that advanced our understanding of the interactions between temperature and precipitation and agricultural decision making. We developed a modeling platform that combines publically available data for individual fields, including precise soil and weather data, with a major cropping system model APSIM. We then conducted an analysis for a specific field in Iowa where we had some historical observations as well as some trial plots within the commercial field. We determined where, within a real field, different combinations of key inputs of fertilizer and seed would increase farmer profits. We also found that the combination that maximized profit often was not the one with the highest yield, meaning if you carefully manage inputs, you could get more profit with less yield. Finally, we found that maximizing profit at lower input rates also resulted in lower losses of nitrogen to the environment.</p>	<p>Food Security (3)</p>

		<p>Our analyses of a single wind turbine and bulk wind turbines within a wind farm indicated that temperature was significantly affected in atmospheric flow that was disturbed by both a single turbine and bulk wind turbines, particularly at night. Effects on atmospheric humidity were more variable or weak compared to the temperature effects. Daytime effects were primarily noted in the surface wind speed which was correlated with increased surface temperatures. In total it is unclear how these combined effects might modify surface processes and agricultural activities, however it is clear that wind turbines can cause detectable changes in atmospheric conditions that have been shown to affect crop growth.</p> <p>We also conducted an analysis focused on determining the impacts of wind turbines on the evolution of the atmospheric temperature profile that leads to cooling at the surface. Our results indicate that for some conditions, a single turbine can accelerate the timing of the surface cooling relative to natural (undisturbed atmospheric flow) and aloft it can extend the period of cooling in the atmospheric layer within 20 m of wind turbine blades. These impacts on timing of the evolution of atmospheric conditions can influence key surface processes like evaporative cooling and carbon dioxide fluxes which have been shown to impact agricultural crops.</p> <p>Our findings have been published in peer reviewed journal articles and conference presentations and posters. We have broadened our programs' reach through media interviews and articles and project websites.</p> <p>IMPACT/OUTCOME: Our increased understanding of cropping systems and the environment of the Central US can lead to effective agriculture management strategies and inform policy decisions regarding adaptation and resilience of agricultural systems. We have also strengthened our understanding of the interactions of wind turbines and wind farms with atmospheric turbulence, and its potential impacts on surface processes that affect agriculture. These advances will lead to further refinements of model algorithms and parameterizations used to scale our field studies from the local to regional scale.</p>	
<p>19.</p>	<p>Genome research about fundamental cellular processes of importance to animal agriculture</p>	<p>ISSUE: The focus of our research is to discover new information about fundamental cellular processes of importance to animal agriculture.</p> <p>WHAT WAS DONE: Genome research. Our research findings this project period are of importance to our understanding of the role of chromatin structure and epigenetic changes in that structure in maintaining genome stability (the induction of high rates of mutations due to mis-repair of DNA DSB is a key process in the development of cancer by genes such as BRCA1). We</p>	<p>Food Security (3)</p>

		<p>also found new and important information about the fundamental mechanisms by which chromosomal structure regulates key gene activities during growth and development.</p> <p>IMPACT/OUTCOME: This increase in our knowledge has implications for better understanding of how neural birth defects may arise through improper epigenetic chromosome modification.</p>	
<p>20.</p>	<p>Ecology and management of arthropods in corn</p>	<p>ISSUE: For U.S. corn growers, annual costs associated with management and yield reductions from insect pests can reach billions of dollars.</p> <p>WHAT WAS DONE: Studies we conducted included how Western corn rootworm moves within the agricultural landscape. Understanding the flight behavior of this insect will help to improve strategies to manage this pest and delay the development of resistance to current management practices. For example, this information will be used by those modeling Bt resistance development in western corn rootworm and developing resistance mitigation strategies, including scientists working for federal and state governments, universities, industry, and regulatory agencies. Other research on western corn rootworm included the discovery of new DNA sequences for genes that are suspected of contributing to Bt resistance, and studies of naturally occurring insect killing fungi that may be used to suppress populations of western corn rootworm and reduce injury to corn.</p> <p>European corn borer is another key pest of corn in the United States. Our research identified two genes involved in circadian rhythm that are the causal voltinism genes in European corn borer. These results are the first to identify the genes that determine voltinism, and will advance the future development of genetic markers to differentiate voltinism ecotypes and estimate levels of gene flow among field populations.</p> <p>One common challenge when managing insect pest of corn is the development of insecticide resistance by these pests. Using the fruit fly, <i>Drosophila melanogaster</i>, which is a model organism for the study of insects, new knowledge has been generated about the mechanisms by which insects develop insecticide resistance. This change in knowledge will enable better strategies to be developed for managing insect pests in corn, in particular, strategies to detect resistance once it arises.</p> <p>Results of these and other studies the project period have been communicated to farmers and other members of the agricultural community, and scientists from many sectors, including regulatory entities, industry, government, and universities. Over the past year, a wide variety of methods have</p>	<p>Food Security (3)</p>

		<p>been used to communicate information about insect pests of corn and their management, including online videos, peer-reviewed publication, presentations at scientific conferences, book chapters and outreach publications, and extension and outreach presentations.</p> <p>IMPACT/OUTCOME: Research and outreach conducted under this project has generated new knowledge to enhance the effectiveness with which pest insects are managed, and to increase agricultural sustainability by delaying pest resistance to current management practices. Furthermore, the results of this work have increased knowledge of fundamental aspects of the ecology and genetics of corn pests, which is directly applicable to the development and refinement of insect resistance management and integrated pest management strategies.</p>	
<p>21.</p>	<p>Investigation of alternative crops for Iowa</p>	<p>ISSUE: Our research is focused on finding ways to increase crop species diversity on the Iowa farming landscape, particularly winter crops that can be used to provide fall, winter, and spring soil cover, to reduce soil erosion and nutrient loss, and increase biodiversity, while maintaining or increasing profitability.</p> <p>WHAT WAS DONE: Using field trials, we investigated the agronomic and economic potential of planting winter canola into full season soybeans with the intent of harvesting high soybeans yields while seeding winter canola at optimum planting dates for Iowa. We found winter canola to be a good candidate for diversifying cropping systems in Iowa, providing winter ground cover to reduce erosion, and living roots to uptake nitrates during the fall, winter, and spring, while having the potential to produce a marketable oilseed crop in midsummer. We found that interseeding into standing soybeans depends on numerous factors to enhance potential of winter survival and optimum weather conditions, including precipitation and temperature, are needed to promote growth of seedlings to reach a minimum of a six-leaf rosette to survive Iowa winters. Preliminary and visual results suggest that there are numerous winter canola varieties capable of producing adequate fall growth, winter survivability, and yield potential to compete in Iowa cropping systems.</p> <p>IMPACT/OUTCOME: It is known that in order to increase adoption of alternative crops, it is critical that yield trials be established that can identify the yield potential of winter canola varieties that are most suited to Iowa climate. The findings of this field-trials project will be used to demonstrate to producers which crops can be added to their rotations to meet their environmental and economic goals.</p>	<p>Food Security (3)</p>

22.	Testing and developing solutions for current and forecasted animal agriculture issues	<p>ISSUE: Bovine tuberculosis is a zoonotic disease — one capable of being transmitted from animals to humans. The disease is caused by infection with <i>Mycobacterium bovis</i>, a pathogen closely related to the one causing human tuberculosis. Bovine tuberculosis causes coughing and lung damage, often leading to death. It primarily affects cattle and white-tailed deer in the United States and can be transmitted to humans who come in contact with infected animals and their meat or hides, or unpasteurized dairy products.</p> <p>WHAT WAS DONE: We developed a new tool that collects extremely low levels of volatile organic compounds emitted by the bacteria, making it possible to differentiate between disease-causing and non-disease-causing strains of Mycobacteria. The device can be used to collect and analyze samples within hours, much quicker than current methods that often take up to eight weeks. In addition to speeding up identification, the new testing platform is also portable and less expensive than tools typically used to test for bovine tuberculosis in the laboratory.</p> <p>IMPACT/OUTCOME: The new screening tool can dramatically reduce the time and cost to detect strains of bacteria that cause a serious livestock disease and that impact the health of millions of people worldwide. The tool is not yet ready for widespread use, but it is expected to soon become part of a standardized test.</p>	Food Security (3)
23.	Opioid hazard indicators in the U.S.	<p>ISSUE: The rapid increase of fatal opioid overdoses over the past two decades is a major U.S. public health problem, especially in non-metropolitan communities. The crisis has transitioned from pharmaceuticals to illicit synthetic opioids and street mixtures, especially in urban areas.</p> <p>WHAT WAS DONE: Using latent profile analysis, we classified 3,079 counties into distinct classes using CDC fatal overdose rates for specific opioids in 2002–2004, 2008–2012, and 2014–2016. We identified three distinct epidemics (prescription opioids, heroin, and prescription-synthetic opioid mixtures) and one syndemic involving all opioids. We find that prescription-related epidemic counties, whether rural or urban, have been “left behind” the rest of the nation. These communities are less populated and more remote, older and mostly white, have a history of drug abuse, and are former farm and factory communities that have been in decline since the 1990s. Overdoses in these places exemplify the “deaths of despair” narrative. By contrast, heroin and opioid syndemic counties tend to be more urban, connected to interstates, ethnically diverse, and in general more economically secure.</p>	Health and Well-Being (4)

		<p>IMPACT/OUTCOME: We increased knowledge of community factors that influence opioid overdoses and overdose prevention, and factors that make communities more or less resilient or vulnerable to opioid overuse. This knowledge and knowledge from future interviews will be used to develop a real-time Big Data opioid hazard indicator using web-scraped data and data science methods.</p>	
<p>24.</p>	<p>Linkages among economic hardship, stress, food insecurity and health outcomes across the lifespan</p>	<p>ISSUE: The focus of this research is to better understand and identify mechanisms to decrease the negative health and behavioral impact of economic hardship, stress exposure, and health outcomes over the lifespan of American children, adolescents, and adults, particularly in low income and minority families.</p> <p>WHAT WAS DONE: We have focused our research and dissemination efforts on increasing knowledge, of policy makers and program administrators, regarding the antecedents of child and adolescent stress and detriments to health, such as obesity, in low income and rural families, but also to specifically examine how economic hardship is associated with stress and health outcomes across the lifespan of American children, adolescents, and adults. In several published manuscripts, pathways of the Family Stress Model (FSM) were examined, which proposes that economic hardship influences later behavioral and health outcomes. One study examined the impact of economic pressure, parent positivity and positive parenting on child social competence. Conclusions of this study revealed that both maternal and paternal positivity and positive parenting are important protective factors for young children's social competence even under times of economic adversity. Another study found that sibling conflict and parental favoritism were positively associated with symptoms of depression, anxiety, hostility, and loneliness, while sibling warmth was negatively associated with loneliness. This highlights how family stress in older adulthood can impact mental health in those over age 60. Another study of ours found that certain socioeconomic background profiles were significantly associated with initially high-risk health outcomes. These and other study findings were communicated, through outreach to policy makers and program administrators, in a series of publications in top-tier peer-reviewed journals and national conferences.</p> <p>IMPACT/OUTCOME: Our research and outreach enhanced the ability of policy makers and program administrators to develop policies and programs designed to reduce negative health outcomes for at-risk families in America across a variety of diverse populations.</p>	<p>Health and Well-Being (4)</p>

<p>25.</p>	<p>Changing the health trajectory for older adults</p>	<p>ISSUE: Adults make daily food and activity choices without being aware of how these seemingly inconsequential decisions impact their health. Numerous biological, environmental and behavioral factors influence an individual's daily health choices. Especially as the older adult population grows in the U.S., so will the aforementioned age-related diseases. This also led us to look into midlife adults as they are more likely than the previous generation to have these conditions and increased obesity. If no action is taken when they reach old age, it can create a public health burden that could reverse recent advances in chronic disease prevention.</p> <p>WHAT WAS DONE: Extension-delivered lifestyle intervention curricula with supplemental materials (e.g. newsletters, handouts, etc.) through the Stay Independent: A Healthy Aging Series reached 196 older Iowans. This has resulted in a significant increase in familiarity among older adults with recommended lifestyle practices concerning eating 3 meals daily, being physically active, eating produce daily, increasing protein intake, and cooking for 1-2. Additionally, the commodity and supplemental food nutrition education program has reached about 4,000 older adults. Conducted follow-up surveys. The SNAP outreach program reached 958 older adults (188 completed surveys) and trained 12 volunteer educators to implement the outreach sessions.</p> <p>IMPACT/OUTCOME: Of those surveyed, 83.9% have used the information provided to make food choices, 90.9% stated the food assistance information or budget-friendly shopping tips have been useful, 63.7% have made at least one of the recipes at home, and 91.1% liked the recipes prepared during the recipe demonstration. Thirty-three were referred for SNAP application assistance and 98.8% were better informed about SNAP after attending the program.</p>	<p>Health and Well-Being (4)</p>
<p>26.</p>	<p>Food Safety Research: Environmental persistence and virulence of Listeria monocytogene</p>	<p>ISSUE: The facultative intracellular pathogen Listeria monocytogenes is responsible for listeriosis, a rare but severe disease in humans and animals, which is acquired primarily through the consumption of contaminated food; particularly "ready-to-eat food" is of high risk. Persistence of L. monocytogenes in food production environments is a big challenge for food safety in many areas of food production, as persistence of Listeria in food production is widely observed. A better understanding of these molecular mechanisms is thus urgently needed to increase food safety and to be able to develop better control mechanisms against L. monocytogenes in the long-term.</p> <p>WHAT WAS DONE: The results of our research this period provided a better understanding of the contribution and genetics of L. monocytogenes chromosomal and plasmid genes to survival in food production environments. We showed that non-coding RNAs both on the chromosome and the plasmids may be crucial for L. monocytogenes stress survival.</p>	<p>Health and Well-Being (4)</p>

		<p>IMPACT/OUTCOME: This increased knowledge can provide a better knowledge basis for assessing the risk of <i>L. monocytogenes</i> occurrence in food and food processing environments in the future.</p>	
27.	Agricultural workforce safety research	<p>ISSUE: The US agricultural workforce received the distinction as the most-deadly industry with a worker fatality rate of 22.6 deaths per 100,000 workers. One contributor to agriculture's high death rate is confined space fatalities caused by entrapment in granular materials.</p> <p>WHAT WAS DONE: The extraction force prediction model, originally developed three decades ago, was refined. Close examination of the initial assumptions used by the prediction model was conducted. Specialized human surface area data necessary for the prediction model was collected for male subjects of various body types and statures. Multiple variable sensitivity analyses for the condition of the model where the victim is completely submerged below the grain surface was completed. Initial analysis of how different male body types influence estimated extraction forces was determined.</p> <p>IMPACT/OUTCOME: For the first time, safety professionals, first responders, developer of standards and others are able to estimate the extraction forces for a male that is not 6 feet tall and weighs 165 pounds. This was the only extraction force estimate that was available until this project. Extraction force estimates for a fully submerged male victim in grain can now be provided with twelve different combinations of stature and body types ranging from short underweight male up to tall extremely obese male. The ability to use these different body types provides a more realistic estimate of expected extraction forces for males submerged in grain. These realistic estimates can improve standard operating procedures for rescuers, update lifeline attachment point safety standards, and provide better understanding while investigating innovative techniques for rescue.</p>	Health and Well-Being (4)
28.	Master gardener - SNAP mini-grants	<p>ISSUE: Iowa food pantries have an urgent need to source more fresh produce to improve to meet their clients' needs for nutritional food.</p> <p>WHAT WAS DONE: The Iowa Master Gardener program partnered with SNAP-Education to offer mini-grants to increase donation of fresh produce to food pantries. In 2019, mini-grants were awarded to 22 counties as part of the Growing Together initiative. Mini-grant funding helped provide materials and mileage to volunteers who grew produce for donation to food pantries. The</p>	Health and Well-Being (4)

		<p>program recruited 277 Master Gardeners who volunteered time to help grow the produce. Another 662 people volunteered to assist Master Gardeners with their work.</p> <p>IMPACT/OUTCOME: The mini-grants have helped achieve a total of more than 115,000 pounds of fruits and vegetable donations that went to more than 76 locations across the state. These donations provided over 345,000 servings of fruits and vegetables for Iowans with low income. The program significantly increased fresh fruits and vegetables to Iowa food pantries and also developed new collaborative relationships with extension teams from the University of Illinois, University of Wisconsin, Purdue University, University of Michigan, and the University of Nebraska.</p>	
29.	<p>Train farmers and technical service providers in using two software packages related to conservation planning and crop nutrient and sediment loss</p>	<p>ISSUE: Planning for appropriate crop nutrient utilization while protecting water quality requires an understanding of nutrient and sediment transport risk. Farmers and technical service providers need ongoing education to keep up with changing methods of risk modeling to result in the best environmental outcomes.</p> <p>WHAT WAS DONE: We trained 82 farmers and technical service providers in using two software packages related to conservation planning and risk estimation of crop nutrient and sediment loss; Revised Universal Soil Loss Equation (RUSLE2) and Iowa Phosphorus Index.</p> <p>IMPACT/OUTCOME: This training increased participants' knowledge of conservation planning by an average of 53%. By implementing the software, participants developed over 117 nutrient management plans. This training has positively influenced 131,000 acres. Participants estimated this training created an additional economic value of \$1.02 per acre.</p>	<p>Natural Resources and Environmental Stewardship (5)</p>
30.	<p>Pasture walk to increase knowledge of the benefits of and issues related to grazing livestock on CRP land</p>	<p>ISSUE: Over the past two decades, Iowa's pasture and forage acres have decreased by approximately 80%. Iowa cattlemen look for alternative forage options to extend the grazing season and improve forage land-use productivity.</p> <p>WHAT WAS DONE: We hosted pasture walks focused on grazing on CRP (Conservation Reserve Program) land for 38 participants. The education sessions also addressed participants' concerns about the potential benefits of grazing on CRP land, land-use policies, and influences on wildlife.</p> <p>IMPACT/OUTCOME: The pasture walks increased more than 80% of respondents' knowledge about routine grazing of CRP land, how grazing management can influence wildlife habitats, and</p>	<p>Natural Resources and Environmental Stewardship (5)</p>

		<p>ways to improve overall grazing management. Participants also indicated the knowledge they learned can be applied to permanent pasture and other forage acres. Respondents estimated the management practices they learned would add an average of \$2-\$3 per acre to their operation.</p>	
<p>31.</p>	<p>Investigations into conservation of aquatic resources</p>	<p>ISSUE: A need exists to provide the science needed to construct conservation management plans based on inherent genetic diversity of rare and endangered species; how these same animals adapt to Iowa's changing landscape; and which aquatic species have the best potential to serve public need and desire for aquaculture products.</p> <p>WHAT WAS DONE: During this project period we conducted basic research into how aquatic animals adapt to changes in their environment, used historical and field analysis of current nutrient inputs into aquatic systems in Iowa, and created new methods for culturing new aquaculture species for Iowa's agriculture operations. The field season in 2019 was year 32.</p> <p>In addition, one of our labs partnered with the Iowa Department of Natural Resources (DNR) to monitor the physical, chemical, and biological components of water quality in 128 of Iowa's recreational lakes. We also partnered with the US Army Corps of Engineers to monitor water quality in the Des Moines and Iowa Rivers and their associated major flood control reservoirs. The data from these water quality monitoring projects have aided in our understanding of how organisms mediate nutrient cycling in lakes and the prevalence of internal phosphorus loading. research formed the basis for several outcomes that impacted this project's targeted audiences. This work has produced an increase in knowledge for the project director, graduate students, undergraduate mentees, and natural resource managers at the state and federal level. Focus areas include 1) ecology and management of invasive Bigheaded Carp in the Upper Mississippi River basin, 2) factors regulating sportfish populations. An increased understanding of how natural resources function among participants and other target audiences of this project will facilitate the improvement of environmental conditions and fisheries management techniques.</p> <p>IMPACT/OUTCOME: Results garnered from this research will be used by public agencies to make the needed changes in their management of Iowa's landscape, whereby water quality is improved and aquatic organisms can enable native species to survive and prosper. Societal benefits include improved water quality for human and animal use, and sustained populations of aquatic animals in Iowa's highly modified landscape. Ultimately, improved environmental conditions and fisheries management will increase natural resource user satisfaction that often results in increased ecological and economic value of these resources.</p>	<p>Natural Resources and Environmental Stewardship (5)</p>

<p>32.</p>	<p>Increasing our understanding of soil, water, and environmental physics; new tools for evaluation</p>	<p>ISSUE: The soil surface layer is very dynamic, and it becomes wetter and drier and hotter and colder than deeper soil. The surface layer greatly impacts the surface energy balance and the surface water balance. Research focused on improving our fundamental understanding of soil physical properties and processes, and how they interact with other environmental and biogeochemical processes across various spatial and temporal scales. We also sought to develop and evaluate new instruments and analytical methods to connect our understanding of mass and energy transport in soil at different scales to environmental transformations.</p> <p>WHAT WAS DONE: This research project produced new, improved ways to measure soil heat flux and soil water evaporation. Only a few examples follow... Existing models for estimating soil water evaporation are accurate when the surface is wet, but they are not accurate when the surface dries. We provided a new approach to measure soil water evaporation from dry soil surfaces. We also developed a simple thermal conductivity model for use in land surface models. Because the model relies only on soil texture and bulk density, it is readily available for use in a wide range of large scale hydrological models. We developed a new thermal conductivity model for unfrozen and frozen soil that provides accurate and consistent thermal conductivity estimates and performs better than existing models. This tool can be used to help increase our understanding of soil physical properties and processes.</p> <p>We also developed a water vapor diode (WVD) that can be used to concentrate water in specified soil layers. The method relies on natural soil thermal gradients, and it has the potential of increasing plant water availability in dry climates. A water vapor diode (WVD), acting as a check valve, allows water vapor flux in one direction but heat flux in both directions. By installing a subsurface WVD, it is possible to impose direction-controlled vapor fluxes, and WVDs can be used to accumulate or remove water in particular soil layers. Numerical simulations indicate that WVDs can increase local soil water contents to support plant growth. The numerical simulation results indicate the potential effectiveness of WVDs, and field tests should be performed to determine their function at specific soil conditions.</p> <p>IMPACT/OUTCOME: Our discoveries provide the means to more accurately determine soil surface water and soil surface energy balances. These discoveries support ongoing crop and forest water use investigations, and they help to improve predictions of drought and flooding by carefully monitoring soil surface conditions. This project contributed directly to the development</p>	<p>Natural Resources and Environmental Stewardship (5)</p>

		and testing of new sensors, theories, and computer programs used to more fully understand dynamic soil surface conditions. In addition, we developed a new tool which has the potential of increasing plant water availability in dry climates.	
33.	Wildlife conservation; focus on health	<p>ISSUE: The health of wildlife populations is receiving increased attention in recent years for several reasons including an increased awareness of the involvement of wildlife in diseases affecting humans and domestic animals and recognition that disease can have important impacts on the conservation of wildlife.</p> <p>WHAT WAS DONE: We a) continued work to identify spatial and temporal variation in Iowa bat populations that will enable managers to better understand likely impacts of White-nose Syndrome and wind energy development on bat populations, b) evaluated the efficacy of ultrasonic deterrents on bat roosting activity in order to help transportation companies minimize negative impacts to bat populations during construction activities, c) identified genome-wide single nucleotide polymorphisms in whitetailed deer to enable improved deer and disease management, and d) began a project to study factors influencing the occurrence of a newly-identified virus in wild turkeys.</p> <p>IMPACT/OUTCOME: We developed new knowledge that can be used to better understand and manage the health of wildlife populations and identify and manage factors associated with disease transmission and spread.</p>	Natural Resources and Environmental Stewardship (5)
34.	Assessing and reducing the soil impacts of crop-residue-removal for biofuel	<p>ISSUE: Society is facing increased need for alternative energy sources, including focus on use of plant biomass. In addition, there is an increasing demand by the livestock production systems for the use of corn stover in feeding and bedding needs. At the same time, society is demanding solutions to issues such as increasing levels of greenhouse gases in the atmosphere and water quality impairment due to sediment and nutrient enrichment. These issues can be impacted by increased crop biomass removal.</p> <p>WHAT WAS DONE: We assessed impacts of various crop biomass harvest levels on processes related to soil organic carbon (C) and nitrogen (N), phosphorus (P), potassium (K), and other nutrients removal, carbon dioxide emission, and water quality.</p>	Sustainable and Renewable ENERGY (6)

		<p>Our research documented that farmers can remove approximately 25-30% of residue after harvest in no-till system and none with chisel plow to keep soil C loss at neutral level and protect soil health. The research also documented C input loss from residue of 0.50-1.0 ton/acre due to residue removal and potential loss of nutrients equivalent to \$10-20/acre. These losses can have negative potential impact on soil health, soil C, soil erosion and water quality and potential long-term decline in productivity.</p> <p>IMPACT/OUTCOME: Our research outcomes led to the development of set of recommendations for the farmers in Iowa and neighboring states who are interested in selling corn residue to the cellulosic ethanol industry or for animal use. The results of this study can also be used by researchers, nutrient management and soil conservation planners, producers, agriculture industry, and government agencies responsible for establishing nutrient management, soil conservation, or environmental regulations guidelines about residue removal.</p>	
<p>35.</p>	<p>Healthy living club challenge</p>	<p>ISSUE: Iowa has a growing obesity rate and ranks 50th in fruit and vegetable consumption in the nation. According to the 2016 Iowa Youth Survey, most of the youth under-consumed vegetables and less than a third of Iowa youth reached the recommended 60 minutes of daily physical activity. 4-H staff saw the need to actively prevent youth obesity and help youth adopt healthy lifestyles in school and at home.</p> <p>WHAT WAS DONE: We launched year two of the Healthy Living Club Challenge across the state. The challenge attracted 150 4-H clubs, representing 3,414 youth. Monthly challenges included increasing youths’ fruit and vegetable consumption, offering water more regularly and incorporating movement into monthly club meetings. A Wellness Officer position was created to organize healthy activities for each 4-H club meeting. Also, 11 youth served as Healthy Living Ambassadors at the state level and attended the National 4-H Healthy Living Summit. They created a 2-day healthy living retreat for high school-aged youth and offered nutritional education at camps or in workshops.</p> <p>IMPACT/OUTCOME: Our program improved youths’ skills in identifying strengths and challenges in making healthy choices and increased youths’ understanding of emotional wellbeing and stress management strategies. Through our program, 604 youth participants reported behavioral changes in healthy living. The behaviors included healthy eating habits, being active, healthy decision making, and food preparation. The youth participants focused on behaviors such</p>	<p>Youth Development (7)</p>

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		as eating breakfast, drinking water, monitoring the consumption of sugary drinks, eating with their family, and avoiding fast food. They were paying attention to how active they were. They also showed a moderate amount of knowledge of food preparation and use of recipes.	
36.	Youth for the Quality Care of Animals (YQCA) certification training	<p>ISSUE: An increasing number of U.S. packing plants require youth livestock exhibitors to complete food safety and quality assurance certification to ensure they are providing a safe food product free of volatile drug residues.</p> <p>WHAT WAS DONE: To make Iowa youth more proficient in the principles and practices of food safety and animal welfare, 4-H Youth Development staff replaced the food safety and quality assurance (FSQA) curriculum with a new national program: Youth for the Quality Care of Animals (YQCA). YQCA certification training is conducted annually with youth livestock exhibitors. Through multiple learning activities, the certification program provides a wide range of training on animal identification, source verification (when and where the animals are born and raised), biosecurity measures (cleanliness techniques, disease contamination, on-farm disease transmission), drug treatments and injections, quality record keeping, and appropriate animal handling and welfare requirements.</p> <p>IMPACT/OUTCOME: In 2019, 10,754 youth became YQCA certified. The YQCA certification training increased all 10,754 youth participants' confidence in reading drug labels, improved their understanding of drug residue and withdrawal times, enhanced their knowledge of biosecurity, and strengthened animal care practices to reduce muscle tissue bruising. The program made youth participants become more interested in learning more about animal science and grew their aspirations to have a job related to animal science.</p>	Youth Development (7)
37.	AmeriCorps outreach	<p>ISSUE: Lower performance in school is often seen in students from economically disadvantaged families or who live in economically challenged communities. The 2015 American Community Survey showed 23% of Iowa children live in households eligible for public assistance. Of those, 15% lived below the 150% poverty level, and 6% live in extreme poverty. The 4-H AmeriCorps program seeks to reach youth in rural communities to increase youth engagement in STEM, civic engagement, leadership, environmental stewardship, and healthy living.</p> <p>WHAT WAS DONE: 37 Iowa 4-H AmeriCorps members reached more than 6,700 youth in K-12 with in-school, out-of-school time, and summer programming. Programming was experiential and activity-based, focusing on STEM, civic engagement, leadership, environmental stewardship, and</p>	Youth Development (7)

		<p>healthy living. The program reached out to 35 Iowa communities from geographical areas that were rural, economically disadvantaged, and/or identified as schools in need of assistance.</p> <p>IMPACT/OUTCOME: At the end of the 2018 – 2019 AmeriCorps program year, 3,308 students completed a 4-H Common Measures survey. 1,804 of the students were in grades K – 3. 1,504 students were in grades 4th – 12th. All of the 3,308 students who completed a 4-H Common Measures survey reported an increase in learning as a result of participating in an AmeriCorps program. More than 70% of respondents in K-3 (N = 2,315) said they learned about making healthy food choices, learned new things about science, and learned to keep trying to reach new goals. For 4-12 grade participants (N = 1,504), all responses increased from the pre- to the post-test. The largest increases were for “giving your family healthy ideas for meals or snacks”; “learning about environmental science”; “looking for ways to help in the community”; “learning how to compare how different things work”; “showing respect for others’ ideas”; and “believing it was easy for them to speak up in a group”.</p>	
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