

2017 Iowa State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Agriculture in the state of Iowa has grown beyond traditional production of crops and livestock to encompass the revolution in the bioeconomy, life sciences, food sciences, value-added products, environmental sciences, and social sciences. Iowa's world-class endowment of natural resources, its highly skilled and educated people, and its well-developed infrastructure supports a diverse and dynamic set of food, feed, fiber, biofuels and bioproducts, environmental and community endeavors. Maintaining high quality of life, especially in rural communities, is a priority for the state to support demographic and production changes.

Iowa's abundance is astonishing, ranking second nationally (behind California) with cash farm receipts (2016) of \$27.13 billion. This position is the result of Iowa's strong ranking in the production of several commodities. The state consistently is the nation's first- or second-largest producer of corn, soybeans, pork, eggs and ethanol, the fourth largest producer of cattle, and in the top dozen for dairy and turkey production. Iowa had 88,637 farms operating on 30,622,731 acres in 2012. Cropland accounts for 91 percent of Iowa's total farm acres (2012). The average-sized farm in Iowa has 345 acres, while the median farm size is 136 acres (2012).

Of Iowa's 99 counties, 21 are located within metropolitan statistical areas (MSAs). Iowa's nine MSAs, which include both rural and urban space, contain 59 percent of its total population (2016). Iowa had 3,145,711 residents in 2017, ranking 30th among states in total population size. Slightly more than one third of Iowa's population lives in rural areas. This 36 percent rural share ranks 12th among states in rural population percentage (2016). Urban areas contain 64 percent of Iowa's residents and about two percent of the state's total land area (2016).

The Hispanic/Latino population, which includes people of any race, is the largest minority group in Iowa, accounting for 5.8 percent of the population in 2016. The Black or African American population, both Latino and non-Latino, is the second-largest minority group with 3.7 percent of residents. The Asian race group is third with 2.5 percent (2016). Iowa's non-Latino white alone population accounts for 86.2 percent of the total population (2016). The poverty rate for individuals in Iowa was 12.3 percent (+/- 0.2%) in 2016, compared to a rate of 15.1 percent (+/- 0.1%) for the United States. Minority students comprised 23.4 percent of preK-12 public school enrollment in 2016-2017, compared to 9.8 percent in 2000-2001.

Continuing demographic change and globalization create ongoing opportunities and challenges toward achieving socially beneficial, economically successful, and environmentally sound systems for food, feed, fiber, fuel, and other value-added products.

The Iowa State University (ISU) Combined Extension and Research Plan of Work for FY 2017 continues to incorporate the five USDA priority areas into our seven current programs. Climate change work is included in Food Security. Childhood obesity work and food safety work, including food safety education for growers, food manufacturers and other professionals, have been incorporated into Health and Well-being. Therefore, we are reporting on seven broad, interdisciplinary programs:

- Community and Economic Development
- Expanding Human Potential
- Food Security
- Health and Well-being
- Natural Resources and Environmental Stewardship
- Sustainable and Renewable Energy
- K-12 Youth Development

Research is conducted across most disciplines in agriculture, defined in its broadest sense, from basic to applied, to make advances in feed, food, fiber, and fuel production, to help increase capacity and provide an adequate and nutritious food supply. The research expressed in the program areas is the result of cooperation among researchers within and between departments and colleges at all levels of activity.

Since the 2016 Plan of Work was submitted, we readjusted and refined the method of calculating research SYs. USDA guidance indicates inclusion of professional FTEs applies only to extension, while research FTEs should include only scientist years. All program FTEs, regardless of funding source, are included per USDA guidance and clarification. We classify the administrative portion of research faculty salaries (i.e., deans, department chairs, center directors, etc.) as "Professional," thus, these are now excluded from the SY total. This more closely parallels how personnel are categorized for the project financial reports submitted in REEport. To emphasize, this applies only to the calculation of research SYs.

Hatch and Smith-Lever formula grants provide critical funding for staffing that ultimately allows us to leverage and match other external funding sources. The formula grants also provide flexibility in programming to better meet current and emerging needs not being addressed by other sources of funding. Without these funds, there would be less applied research, less real world application of research, and less integration of extension and research work.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	371.0	0.0	187.3	0.0
Actual	381.0	0.0	167.1	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Merit review: 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. Surveys 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.

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 ISU (typically 2 to 4 faculty) for a thorough review of the scientific merit. Depending upon the reviews, the project is either approved, revised based on reviewer comments, or rejected.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder individuals
- Other (Comments gathered from targeted online venues)

Brief explanation.

The majority of programs use media and the internet to announce public meetings and listening sessions, and use targeted invitations to traditional stakeholder groups and individuals. In addition, the various programs have employed the following:

- Ad hoc surveys of residents in specific communities are conducted to obtain feedback.
- Team members are in regular contact with primary stakeholders at meetings, electronically, and on an individual basis.
- Producers, suppliers, policy makers, and other interested parties are invited to state-wide webcasts.
- The Dean's Advisory Council which meets twice a year.
- End-of-meeting and post-program surveys consistently seek input for future research and programming needs.
- Responding to stakeholder input to encourage additional input.
- Identify existing stakeholder meetings, ask to be placed on the agenda, and ask stakeholders to answer questions or provide input.
- Faculty and staff have developed relationships, key to quality interaction with stakeholder groups, and actively participate in a variety of events where stakeholders are present for interaction.
- Surveys, focus groups and on-going informal assessments match program delivery methods with preferences of stakeholder groups. Decisions regarding content, delivery, and mechanisms to reduce barriers to participation are made with a goal of increasing participation.

- Blogs and other online venues gather comments on programming.
- Post-program site visits and one-on-one interviews with clients to measure impacts and to obtain client feedback.

One example: Thirteen Family Finance Extension Team members engaged in a program planning process utilizing an appreciative inquiry method. More than 40 Iowa stakeholders were interviewed about their successful experiences that resulted in improved family economic well-being, and their values and their hopes for a better future. The goal was to develop a plan for extension work that addresses family economic issues for the next 3-5 years, in order to be responsive to needs of Iowans. Several themes emerged from the appreciative inquiry process and recognized the importance of: 1) establishing relationships with participants, community agencies and other stakeholders, 2) providing action-oriented learning, 3) understanding poverty, 4) providing empowerment-oriented learning and 5) advocating through education. Interview results informed new guiding principles for our Family Finance work: strive to be high impact, address emerging issues, tailor to the audience, offer strategies that promote sustained action/behavior change, recognize our internal capacity and community capacity, integrate community engagement, and co-create efforts with the community.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Needs Assessments
- Use Surveys
- Other (Media -- press releases, websites, social media; CED program's quarterly newsletter, "Community Matters")

Brief explanation.

The College of Agriculture and Life Sciences has 18 Dean's Advisory Groups which are asked annually to provide guidance on research priorities. These include the Center for Crops Utilization Research Industry Stakeholder Advisory Board, Seed Science Center External Advisory Council, Iowa Pork Industry Center Advisory Committee, Wallace Foundation for Rural Research and Development, etc. In addition, faculty and Experiment Station leadership meet with and/or participate in 321 agricultural/stakeholder agencies, organizations, cooperatives and industries and 22 educational institutions.

ISU Extension and Outreach conducted a formal needs assessment in 2013, which was reported in the 2014 Annual Report of Accomplishments and Results. Such extensive efforts are undertaken on a periodic basis, and are supplemental to ongoing efforts such as these listed below for 2017.

- Formal advisory boards; we invite representation from the organizations and agencies that work in a given area, and may also include producers nominated by extension program specialists, campus specialists and campus researchers.
 - Web-based needs assessment and listening sessions open to the public. Targeted groups are identified and contacted. Steering committees identify key individuals to ensure that the invitation list represents the broad spectrum of stakeholders.
 - External focus groups include information from peer groups. Conduct needs assessments informally via routine contacts with target audience or formally via surveys.

- Underserved communities are engaged regarding educational program needs, beta testing materials and promotion of educational events.
- Extension state and field specialists serve on multiple county and state advisory committees where needs are identified and used to shape program efforts.
- Extension specialists increase their understanding of audience needs through hundreds of personal contacts, telephone calls, e-mail messages and blog comments received each year from potential clientele, of the individuals and groups that will have interest in their programs. Recommendations are also received from county-based Extension staff, campus faculty and staff, and commodity/producer organizations.
- Participants provide personal contacts for our planning process; much attention is paid to major client groups and their boards of directors and other key influences. Suggestions from university administration are an excellent source of contributors.
- Faculty and staff are members of coalitions and taskforces at the state and local level that continually review and check changing needs against operational plans.
- Meeting with representatives from federal and state agencies regularly allows for input from consultants throughout the state. Attendance at state and national meetings allow input from individuals, as do email contacts from the web site.
- Media and surveys are used to identify interested stakeholders. State staff hold conversations with individuals in more than 30 key state agencies and state organizations to share information and seek input.
- Post-program site visits and one-on-one interviews with clients to measure impacts and to obtain client feedback.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

Efforts on an ongoing basis include:

- Meetings with College of Agriculture and Life Sciences Dean's Advisory groups, 18 groups that the Agricultural Experiment Station administrators meet with on a regular basis.
- Meetings with College of Human Sciences Dean's Advisory Council
- Faculty and Experiment Station leadership meet with and/or participate in 321 agricultural/stakeholder agencies (43), organizations (155), cooperatives (16) and industries (107), and 22 educational institutions.
- ISU Extension and Outreach state and field specialists serve on multiple county and state advisory committees where needs are identified. ISU Extension and Outreach staff use this information to shape program efforts.
- Listening sessions with current and potential clients.
- Targeted and random surveys to current and potential clients.
- Contacts are ongoing by field staff, county extension staff, and state specialists who work with

individual private sector partners.

- Meetings are held with professional associations and advisory boards, and other groups across the state, providing information and asking for input both on existing and emerging issues, and to assist in better understanding local needs.
- Select stakeholders are asked to serve on advisory boards, leadership councils and work teams to help set program direction, develop innovative programs to reach new audiences, and implement strategies to reach desired outcomes.
 - Webinars share information and new program direction and receive input from stakeholders.
 - Participants are often surveyed about needs and interests.
 - Participants are often asked to complete a survey at the beginning and end of training to assess their needs and how the training series can be improved, as well as a self-assessment to identify specific knowledge and skills participants gain from the training. These data are continuously reviewed to modify the training as appropriate. Follow-up surveys sometimes occur, and website contacts for information are provided.
 - Personal contacts initiated by the stakeholders with research and extension/outreach faculty and staff.
 - One-on-one interaction, surveys from clients at public meetings, discussions with advisory board members, e-mail communication including responses to Web and other media.
 - Surveys allow those unable to attend meetings to voice opinions about needs and program planning processes. Follow-up meetings with select individuals providing 'missing voices' are conducted to gather broad-based input.
 - Each community determines how they collect input, utilizing a variety of methods, including personal conversations, web surveys, speaking to individuals and groups, and work with the media.
 - 4-H Youth Development conducted a customer satisfaction survey of internal audiences (county youth staff, county directors, regional directors), which was used to inform program priorities.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Agriculture and Natural Resources Extension:

- Expanded water quality and nutrient reduction education.
- Provided resources and support during floods and droughts.
- Responded to the emerging threat of Palmer amaranth.
- Implemented training programs regarding the Veterinary Feed Directive.
- Conducted staff professional development on the concept of community change, to support the continued development of beginning and young farmer peer groups.
 - Farm Financial Task Force met quarterly to provide objective analysis of farmers' financial conditions and options and programming on cost control and financial management.
 - Targeted programming for women in ag, focused on business management, human resources, grain production and livestock production.
 - State-wide local foods work group met quarterly.

Human Sciences Extension:

- Hired people of diverse backgrounds for The Buy, Eat, Live Healthy program.
- Hired a faculty member for the summer to develop programming for individuals with Parkinson's Disease and their families.
 - Hired a state specialist to support programming for older Iowans and their caregivers.
 - Implemented The Adventure Comes to You, a partnership with the Department of Food Science and Human Nutrition. Faculty visited four sites in Iowa and shared their innovative research and information related to mindful eating and epigenetics.
 - Supported the growth and expansion of new programs launched last year, including Essentials of Child Care Preservice Online Program; Raising School Ready Readers; What About Me? My Wellbeing; Elevate: Take Your Relationship to the Next Level; and Growing Together Iowa (healthy food access for families experiencing poverty).

Community and Economic Development:

- Provided business planning and feasibility assistance to minority-owned businesses.
- Continued to add data and accessible real-time reports to Indicators Portal, a one-stop information site for local and regional community decision makers. Added systems analyst position to increase the breadth and depth of data available through the portal.
 - Partnered with Community Food Systems program to promote local food systems.
 - Trained local elected officials and government and nonprofit employees on issues such as budgets, planning and zoning, and nonprofit management in response to changing laws and regulations.
 - Continued collaboration with Center on Sustainable Communities.
 - Delivered "Navigating Difference" cultural competency training throughout the state.
 - Developed a tourism workshop and trained business owners and entrepreneurs.
 - Hired a retail trade specialist to provide technical assistance to retail business owners, and to communities seeking to build stronger local retail economies.
 - Developed Leading Communities curriculum to strengthen communities' leadership capacity.

Youth:

The "Iowa 4-H Core Principles and Organizational Structure" document is now used in core training and orientation for new state and county youth staff, and County Extension Council members. By providing this clear and consistent framework for the roles and relationships between the state and county 4-H programs, 4-H programming in Iowa has improved greatly.

Brief Explanation of what you learned from your Stakeholders

Our stakeholders have identified the following as priorities:

- Continue leadership of the Monarch Consortium - Iowa has a vital role to the monarch butterfly's recovery
 - Plant and animal genomics
 - Genes to Fields (G2F) - translation of corn genomic information to achieve advances that generate societal and environmental benefits
 - Digital Agriculture - making agriculture more efficient and sustainable through technological advances
 - Antimicrobial resistance
 - Studying the microbiome - the full collection of genes of the microbes that live in our bodies, to support scientific advances

- Water quality / nutrient reduction strategy
- Farm transition: retirement and beginning farmers
- Farm financial health and risk management
- Responding to and complying with legislative mandates for livestock care

We learned from stakeholders that our focus on **health and well-being** and **expanding human potential** are aligned with the needs and desires they expressed. In particular, these specific areas were mentioned:

- Family life (examples: relationships, communication, parenting, time and stress management, mental health/disability, youth development)
- Financial stability (examples: money management, cost of living, estate planning,)
- Child Care (examples: cost, quality, access)
- Health and Health Care Coverage (examples: nutrition, obesity, physical exercise, outdoor education and recreation, healthy children, food safety, insecurity, and systems)
- Growing older (examples: health, retirement, caregiving, death)
- Community capacity (examples: access to education (literacy), jobs, social networks, and resources)

Top issues for the Community and Economic Development program include:

- Changing demographics
- Local economies
- The built environment
- Civic engagement and leadership capacity

Youth: Serving over 100,000 Iowa youth, Iowa 4-H by nature is complex. While 4-H looks different in each county it has basic assumptions and rules (the glue) that keep it cogent and effective. The "4-H Core Principles and Organizational Structure" document was developed to provide a common set of core understandings driving the Iowa 4-H program so that as a system, Iowa 4-H can meet its goal of making Iowa 4-H the best youth development program in the nation. For 2018 4-H will focus on the following programmatic efforts inclusion, civility and college/career readiness. In addition, Iowa 4-H will be reviewing and upgrading its evaluation efforts.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	9099090	0	10886967	0
Actual Matching	9099090	0	10886967	0
Actual All Other	18957508	0	64454040	0
Total Actual Expended	37155688	0	86227974	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	9099090	0	6285689	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Community and Economic Development
2	Expanding Human Potential
3	Food Security
4	Health and Well-being
5	Natural Resources and Environmental Stewardship
6	Sustainable and Renewable Energy
7	Youth Development

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Community and Economic Development

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	0%		40%	
603	Market Economics	0%		35%	
605	Natural Resource and Environmental Economics	0%		5%	
608	Community Resource Planning and Development	100%		20%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	8.9	0.0	1.8	0.0
Actual Paid	9.9	0.0	2.2	0.0
Actual Volunteer	3.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
934018	0	378096	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
934018	0	378096	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2134137	0	562445	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conducted workshops and educational efforts with community organizations, individuals and leaders to assist developing and implementing plans for physical and social community improvements.
 - Conducted research and outreach to communities on planning, zoning, resource management, and community and economic development activities using a variety of information dissemination methods.
 - Held training sessions to improve skills of local government officials, community leaders and individuals.
 - Conducted participatory research, outreach and training with leaders, workers and individuals to improve the effectiveness and skills of leaders and volunteers in community organizations. Developed Leading Communities curriculum to improve communities' leadership capacity.
 - Continued to increase the data services available on the ISU Extension and Outreach Indicators data portal created in 2014 through which Iowans are able to access a wide range of products using local finance, economic, and demographic data, all available from one website.
 - Hired a systems analyst to increase the breadth and reach of data available through the Indicators Portal.
 - Conducted Navigating Difference© cultural competency training throughout the state.
 - Hired a retail specialist to provide technical assistance and consultation, develop educational curriculum, and deliver educational programs for retail business owners and for communities seeking to build stronger local retail economies.
 - Conducted Customer Service Training for the Tourism Industry in 40 cities throughout the state.
- Faculty participated in relevant multi-state research committees: NC1030.

2. Brief description of the target audience

Businesses, organizations, public officials, community leaders, public and nonprofit organizations, and underserved populations (e.g., Latinos, African-Americans, refugees and the organizations that serve them), in Iowa.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	56996	124687	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of articles, publications, reports, plans.

Year	Actual
2017	2593

Output #2

Output Measure

- Number of communities receiving planning and design assistance.

Year	Actual
2017	801

Output #3

Output Measure

- Number of jobs created/retained.

Year	Actual
2017	298

Output #4

Output Measure

- Number of people in underserved populations assisted.

Year	Actual
2017	925

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Community visioning and design: Number of communities receiving planning and design assistance.
2	Community economic development: Number of jobs created or retained.
3	Minority community and economic development: Number of people in underserved populations served.
4	Increased understanding of factors that contribute to the creation or improvement of the policies and programs that improve the functioning of agricultural and rural financial markets

Outcome #1

1. Outcome Measures

Community visioning and design: Number of communities receiving planning and design assistance.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	801

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A gap exists between demand for planning and design services to rural Iowa communities and the availability of those services. Many smaller communities in Iowa face issues that they are unable to address due to lack of planning personnel and/or resources. Issues facing communities include Iowa's changing demographics: the population is aging and at the same time becoming more diverse. A combination of factors such as aging infrastructure, resistance to additional taxation, depopulation, and lower population density are pushing small local governments' budgets to their limits. Legislative and economic issues also impact nonprofit organizations.

What has been done

The ILR Community Visioning program assists small towns develop design plans reflecting the values and identity of the community. The Community Food Systems program uses agricultural urbanism tactics to promote local food system revitalization in communities. CD-DIAL conducts surveys for communities as part of their long-term planning activities. Extension CED trains local governments, COGS, and nonprofits. CED specialists developed a tourism workshop to help Iowa communities reinvent themselves as tourist destinations. Six CED Extension staff received training on Navigating Difference, a cultural competency training program. CED faculty and staff created a new leadership curriculum titled Leading Communities and has been offering the training statewide.

Results

Ten visioning communities received conceptual design plans, feasibility studies, and implementation planning assistance. CD-DIAL conducted surveys in 2 towns. 39 people from 15 towns attended GIS workshops conducted by CED's Geospatial Technology Program. CED Extension trained 393 nonprofit employees in 50 towns. 377 government officials, city and county employees, and planners from 66 towns attended CED Extension's Introduction to Planning and

Zoning workshop, held at 8 locations throughout the state. The Office of State and Local Government Programs provided training to representatives from 652 communities through 2016 Municipal Professionals Institute/Academy, budget workshops, the Municipal Leadership Academy, and annual fiscal report workshops. CED staff delivered Navigating Difference; training to 67 people in 3 communities. CED specialists conducted housing needs assessments in 2 communities and collaborated with the City of Dubuque to analyze and provide recommendations for the city's Central Avenue Corridor. More than 2,100 individuals downloaded a total of 4,406 reports.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Community economic development: Number of jobs created or retained.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	298

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Due to the housing crisis, financial crisis, and recessionary layoffs, a growing number of people are facing financial stress, credit issues, and loss of income. Small business and jobs creation is particularly important for sustaining family income for many people during economic recovery. Many communities in Iowa lack the resources necessary to develop innovative projects and initiatives designed to improve their economic growth. The recent recession and the property tax cut have further affected economic growth in these communities and they are looking for innovative ways to attract new residents, visitors, and businesses.

What has been done

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 is part of the Iowa Retail Initiative (IRI), a collaboration to create thriving

rural communities that involves College of Design studios in community economic development projects. Extension CED shares joint positions with the Keokuk Area Chamber of Commerce and the University of Nebraska. A team of ISUEO CED Program Specialists developed Customer Service Training for the Tourism Industry and trained business owners and entrepreneurs throughout the state. CED hired a retail specialist to provide technical assistance to retail business owners and for communities seeking to build stronger local retail economies.

Results

In 2017, 298 jobs were created or retained within the businesses CED specialists worked with. More than 200 businesses were started or expanded with help from Extension CED. Of those, 31 were minority entrepreneurs. CED specialists trained 1,885 business leaders/entrepreneurs. Hospitality Customer Service Training was delivered to 1,276 business owners, entrepreneurs, and local leaders in 40 communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

Minority community and economic development: Number of people in underserved populations served.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	925

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The percentage of Iowa's population identified as minority grew from 3.1% in 1980 to 13.8% in 2016. Minorities as a percentage of total population have increased in 98 of 99 counties. Over the last 5 years, more than 3,000 refugees have arrived in Iowa. The influx of immigrants to the state creates the need for support to New Iowans, as well as the need for long-time residents to adapt to their communities' changing demographics. Iowa also faces significant challenges in dealing with mental health, and ranks 49th out of 50 in terms of available beds for mental health patients. During the 2017 session, the Iowa Legislature passed Senate File 504, instructing stakeholder work groups to meet and create collaborative policies to support individuals with mental health

needs.

What has been done

ISU Extension CED continues to aggressively employing outreach strategies for underserved populations. Through programs such as JUNTOS, CED Extension educates youth on career options as well as strategies for pursuing higher education. CED is building relationships with minority populations in the urban areas in Iowa broadly, and Des Moines and Cedar Rapids specifically, in partnership with the Black Business Coalition, Black Business Consortium, NAACP, and others. Six CED Extension staff received training on Navigating Difference, a cultural competency training program. CED specialists provided strategic planning assistance to the CROSS Mental Health Region to create a community services plan to address the area's needs in terms of mental health care.

Results

CED specialists provided JUNTOS training for 45 Latinos, and provided immigration rights information to 150 immigrants, and education, outreach and/or facilitation to 293 people in minority populations. CED specialists assisted 35 entrepreneurs from underserved populations in starting or expanding their businesses. The Refugee Summit (sponsored in part by CED) provided education and services to 320 refugees and representatives from organizations serving refugees. CED staff delivered Navigating Difference training to 67 people in 3 communities. Strategic planning for the Cross Mental Health Region resulted in assistance to 15 individuals with mental health-care needs and the strengthening of 29 mental health-care organizations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Increased understanding of factors that contribute to the creation or improvement of the policies and programs that improve the functioning of agricultural and rural financial markets

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Recent trends in agricultural markets have led to lower profits and more stressed financial conditions in the sector. Research is needed to gain insights for agribusiness managers that can improve the functioning of agricultural and rural financial markets.

What has been done

Studies performed and published provided farmers, extension, policy makers, agribusiness managers, and researchers with the current financial situation of farms and cooperatives, and management tools available to cope with risks in agriculture.

Results

The activities conducted increased target audience's knowledge of the financial management issues and trends affecting farms and cooperatives. Examples include: We provided industry-level updates that co-op boards and management used to benchmark their own performance, understand the implications of commodity price and expense trends, and analyze the impacts of changes in industry tax environments. We conducted and published a study about Multiyear insurance, a new financial management tool being developed to help protect farmers from risks over several years. We examined data for a panel of 273 Iowa farms collected by the Iowa Farm Business Association. We found that average indicators of liquidity and solvency remain close to their long-term levels, but average financial measures mask wide variability across Iowa farms, and financial conditions have deteriorated since 2012.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
603	Market Economics
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The economy is a major external factor affecting both Research (agricultural markets) and Extension CED outcomes because not only has it led to a shrinking state budget, but also because more communities need assistance with budgeting and financial management and some local businesses are struggling. That said, the economic climate is good for entrepreneurship. CED specialists have been working with communities on issues such as affordable housing, land use practices, and population shifts. The immigrant population of Iowa continues to grow and CED has responded with diversity training, and providing training on parenting skills, budgeting, and language. Minority-owned businesses are the fastest growing source of small-town entrepreneurialism. Hence, assistance to immigrant entrepreneurs is a key component of CED's economic development strategy. More

communities are trying to re-invent themselves from agricultural towns to tourist destinations, and CED has responded by developing training for the tourist industry. Changes in local, state, and federal law require ongoing training for state and local government officials and employees.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

End of program evaluation of the following programs has led to material changes in content and delivery: Municipal Professionals Institute and Academy, budget workshops, tourism workshops, and planning and zoning workshops. Evaluations from multiple programming efforts and from stakeholder input has led to developing a community-based leadership program (Leading Communities), cultural competency training (Navigating Difference), and housing needs assessment and planning for smaller cities.

Key Items of Evaluation

Community programming is often not intuitively related to what is seen as Agricultural Extension. CED continued to publish its quarterly newsletter and improve the CED website and social media strategies for the purpose of gaining visibility of our programs to community leaders. Several CED initiatives addressed healthy communities (the Sustainability Collaborative, Community Visioning, Community Food Systems program). Six CED Extension staff received training on "Navigating Difference," a cultural competency training program. CED specialists developed Leading Communities, a curriculum designed to build leadership capacity in communities. CED continues to develop programming for the growing minority and refugee population in Iowa.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Expanding Human Potential

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	0%		15%	
801	Individual and Family Resource Management	30%		32%	
802	Human Development and Family Well-Being	70%		29%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		24%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	12.1	0.0	3.6	0.0
Actual Paid	11.5	0.0	5.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1025829	0	261149	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1025829	0	261149	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2327729	0	16125	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Short-term and in-depth sequential educational programs were directed toward individuals, families, professionals, and community leaders through one-on-one education, workshops, meetings, conferences, online learning, and social and mass media. Community volunteers were trained to provide income tax preparation assistance to families with moderate and low incomes in underserved, rural communities. Agency personnel were trained to provide individualized financial education to their clientele. Programs were designed to strengthen financial knowledge and skills regarding family financial management. We developed products, curricula, on-line tools, and other educational resources for use in training, technical assistance, and facilitation of community-based processes.

Faculty participated in relevant multistate research committees: NC1198, NC1030, NC2172, W2192, NC1171, and NC0170.

2. Brief description of the target audience

Parents of children, teens, young adults, families with lower incomes, child and family caregivers, family serving professionals, health professionals, worksite employees, policy makers, businesses, community members and leaders, adults, older adults, education professionals, and employers.

3. How was eXtension used?

ISU Extension and Outreach websites are linked to eXtension resources (e.g., Science of Parenting blogs, podcasts, FAQs, publications, archived webinars and web-based tools). Additionally, eXtension resources were actively promoted to Iowa early care and education and family support professionals through social media and shared with newly trained class leaders. The eXtension Family Caregiving resource is linked on our Powerful Tools for Caregivers web page and selected eXtension websites were linked on ISUEO financial management webpages (e.g., the Ask the Expert link on the Finances of Caregiving webpage connects learners to eXtension's Health Insurance Literacy faculty group and FAQs from eXtension are linked on an ISUEO family finance webpage).

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40955	219902	945	2025

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	46

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of parents and family members participating in educational programs related to child care, parenting, couple relationships, and aging.

Year	Actual
2017	10786

Output #2

Output Measure

- Number of professionals or volunteers trained to work with programs related to child care, aging, couple relationships, and parenting.

Year	Actual
2017	23302

Output #3

Output Measure

- Number of individuals participating in family finance educational programs.

Year	Actual
2017	7393

Output #4

Output Measure

- Number of professionals or community volunteers trained to work with families on financial management.

Year	Actual
2017	151

Output #5

Output Measure

- Number of adults participating in educational programs that increase awareness of public issues.

Year	Actual
2017	387

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percent of parents improving parenting skills.
2	Number of professionals trained to provide education and/or support to families.
3	Percent of early child care providers improving learning environments and teaching strategies.
4	Percent of caregivers better able to manage later life issues.
5	Percent of individuals improving personal and family financial management practices.
6	Percent of individuals making progress toward financial goals.
7	Percent of professionals or volunteers who are better prepared to apply or teach financial management skills.
8	Utilize our Local Foods Program to provide skills training to incarcerated women in Iowa (number trained)
9	Number of family-serving professionals receiving current, research-based information regarding factors that contribute to barriers to the physical and mental health of diverse, rural, low-income families
10	Increased knowledge of mechanisms that have the potential to increase and enhance human health spans

Outcome #1

1. Outcome Measures

Percent of parents improving parenting skills.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Parenting education reduces tax dollar expenditures by creating stable families, reduces reliance on public assistance and risky youth behaviors - substance abuse and early sexual activity. The Partnership in Prevention Science Institute research found a community can expect for every dollar spent on the Strengthening Families Program for Parents and Youth ages 10 to 14 (SFP 10-14), \$9.60 comes back to the community as benefits in less jail time, less time off work, and less time in treatment. Parent involvement and academic support are important for youth to succeed in school.

What has been done

3,723 parents participated in parenting education (1,178 participated in sequenced workshops, 267 participated in individual consultations, 2,278 were reached via newsletters). Research- and evidence-based curricula implemented include: SFP 10-14/Familias Fuertes, Family Story Teller, Together We Can: Creating a Healthy Future for Our Children, Growing Strong Families, and Juntos Para Una Mejor Educación. More than 100 community volunteers partnered with Extension and Outreach to implement Juntos Para Una Mejor Educación (Together for a Better Education) in 7 communities with 82 Latino families (171 youth, 155 parents).

Results

Nine out of ten parents who participated in a series of parenting education workshops improved their parenting skills (92.62 %; N=271). 1178 parents increased awareness of positive parenting practices. Parents (N = 1,196) increased their awareness of strategies to promote reading among their children. The majority of parents (90%; N=453) improved their parenting skills after participating in SFP 10-14/Familias Fuertes over a 7-week period. Nine out of ten youth (89%; N=448) who participated in SFP: 10-14 engaged in more positive behavior (e.g., resist peer pressure, delay onset of substance use). Parents and youth who participated in Juntos

significantly increased communication with each other about youth's goals for their future (N=197; p=.001). Parents became more confident in helping their youth graduate from high school and pursue higher education (N=107; p=.001). Youth increased communication with teachers about their progress in school (N=90; p=.05).

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #2

1. Outcome Measures

Number of professionals trained to provide education and/or support to families.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2143

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Effective family life education relies heavily on quality implementation; specifically, how individuals are trained, supervised, and supported in their work with families. Professionals must learn to work across cultures, disciplines, and systems, master a growing and diverse body of knowledge, be adept at processes and methods that truly strengthen families, and produce results in short periods of time.

What has been done

A total of 2143 professionals and 72 volunteers were trained by ISUEO staff in evidence-based (e.g., SFP: 10-14, Family Story Teller, Powerful Tools for Caregivers) and research-based Small Talk, Juntos Para Una Mejor Educación; Healthy Relationship and Marriage Education training program, Together We Can) curricula to deliver family life education directly to families.

Results

Extension and Outreach staff trained 2143 professionals and 72 volunteers to implement Extension and Outreach family life education programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

Percent of early child care providers improving learning environments and teaching strategies.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	95

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa currently ranks first in the nation for the percentage of young children with employed parents. More than 70% of Iowa children from birth through age 6 are in child care. Demand is high for quality early childhood programs. Workforce turnover is reported at 40-52% annually and most child care professionals have limited early childhood education. By 2020, the number of child care professionals is expected to increase nationally by 20%. Research has shown that the early years in a child's life represent a critically important window of opportunity to develop a child's full potential and shape key academic, social, and cognitive skills that determine a child's success in school and in life.

What has been done

The Essentials Child Care Preservice Online Program (12 Modules) was developed to improve health and safety practices. The Early Childhood Environment Rating Scale (ERS) program provided child care professionals with a self-assessment, instruction, and guidance in developing an improvement plan to strengthen program quality with the option of a follow-up formal assessments. The New Staff Orientation (NSO) program provided 16 hours of instruction for child care center staff and program directors. Child Care Resource and Referral consultants participated in a consultant credential and mentor credential program. Over 75 single topic child care provider workshops on health and safety and early learning were conducted across the state. Websites, FCCERS, Pinterest, and the Let's Talk Child Care Blog supported training.

Results

A retrospective survey of Early Childhood Environment Rating Scale participants (n=388) indicated that 95% of participants could better identify strengths and limitations, prioritize changes, and had initiated a workable plan for program improvement. Environment Rating Scale assessments were conducted to document quality of 155 child care classrooms. In the I-Consult program, 37 early childhood education consultants learned and demonstrated skills in coaching and consultation, and 11 consultants earned an I-Consult credential. An additional 2,197 early childhood professionals participated in child care community and online workshops. Of the surveyed participants (n=1,598), 95% reported or demonstrated improving learning environments or teaching practice.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #4

1. Outcome Measures

Percent of caregivers better able to manage later life issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	96

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2015, an estimated 34.2 million Americans provided unpaid care for an adult age 50 or older (National Alliance for Caregiving and AARP). They provide a vast array of services (e.g., emotional, financial, nursing, homemaking) on a daily or intermittent basis. The impact on caregivers is threefold: physical, emotional, and financial. One in five caregivers indicate their health is fair or poor and one in four say their health has declined from caregiving. One in five report a high level of physical strain. Two in five consider their caregiving situation emotionally stressful. Improved self-care practices by family caregivers leads to reduced reliance by caregivers on health care and public services.

What has been done

Eighteen new Class Leaders were trained by ISUEO master trainers to co-lead the Powerful Tools for Caregivers programs in their communities. They join a team of 125 class leaders

prepared to deliver the program throughout Iowa. One hundred and five (105) individuals received individual consultations regarding family care-giving issues. 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 program can now be delivered to two target audiences: caregivers of adults with chronic conditions and caregivers of children with special health and behavioral needs. Caregiving Relationships: Conversations on Aging is another offering which can be used as either an introductory or stand-alone program.

Results

Two hundred ninety-nine (299) family caregivers participated in Powerful Tools for Caregivers (PTC) series, and 96.3% (N=271) reported increased self-care practices (increased exercise, use of relaxation techniques, self-care) after participation in PTC. They also increased self-confidence in their caregiver roles and improved management of emotions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #5

1. Outcome Measures

Percent of individuals improving personal and family financial management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa lags behind the nation in median household income despite a low unemployment rate. Nearly 15% of Iowa children live below the poverty line (American Community Survey, 2016). Roughly 1 in 12 Iowans hold down more than one job, reflecting in part low wages which push families into second or third jobs to make ends meet. Only 3 other states have higher multiple job rates. Time and financial pressures result in family stress. Empirical studies document Iowans' incomplete knowledge and skills to manage limited financial resources effectively. Skills in setting priorities and developing plans reduce stress and increase satisfaction. Skills in accessing,

evaluating and using reliable, research-based and non-commercial information facilitate making informed decisions leading to greater financial security.

What has been done

Financial management skill-building programs were attended by 6,946 adults. Timely financial information reached 30,926 indirectly through social media, downloads of Extension and Outreach publications, a blog, and other web-based sources. Research-based programs targeted families with low- and moderate-income to improve basic budgeting, credit use and financial services access. Workshops addressed financial challenges unique to women, new immigrants, those nearing retirement and those addressing financial concerns of older parents or other family members. Incarcerated individuals participated in weekly money management workshops. Webinars and other online course offerings targeted young families, first-time homebuyers and other lowans preferring web-based learning.

Results

At the conclusion of programs composed of at least two sequential workshops, 85% (323 of 379) of participants surveyed reported improved money management skills. This average includes 77% of participants in Your Money, Your Future basic budgeting classes who reported improved skills in recordkeeping, planning, evaluation and assessment of reliable sources of information; 79% of participants in Money Talk who reported improved managements skills; 98% of participants in Finances of Caregiving who increased understanding of issues; and 85% of participants in retirement planning workshops who evaluated income sources available in retirement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #6

1. Outcome Measures

Percent of individuals making progress toward financial goals.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	63

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With stagnant wages and an increasingly complex marketplace, consumers face headwinds in making progress toward financial goals. Studies show that those who set specific goals are more likely to achieve them. Those who close the gap between current and desired conditions are more likely to report satisfaction or higher levels of economic well-being. Failure to set goals often leads to mismanagement of scarce resources, added stress, and significant social and economic costs to families and society.

What has been done

Financial management workshops were attended by 6,946 adults. In addition, 30,926 individuals were reached indirectly through social and mass media, displays and webpages. Workshops focused on the goal-setting process and addressed specific financial goals (e.g., planning to achieve a balanced budget, short-term savings accumulation, organization of financial documents, and estimation of retirement income needs). Money Talk workshops, a 5-week series, addressed financial planning issues of interest to women. Basic budgeting workshops emphasized short-term goal achievement. Finances of caregiving workshops emphasized the understanding of goals relevant to later life.

Results

On average, 63% (168 of 265) of surveyed participants in sequenced, in-depth workshops reported behavior change, making progress toward specific financial goals. 83% of the participants in basic budgeting workshops reported making progress in achieving budgeting goals. Among Money Talk participants, 73% reported progress on goals related to savings, reduction of debt, and retirement preparedness. 29% of participants in finances of caregiving workshops reported taking steps to protect their retirement savings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #7

1. Outcome Measures

Percent of professionals or volunteers who are better prepared to apply or teach financial management skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	78

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Studies support integration of financial education into existing, on-going programs and venues that consumers frequent. This strategy is often more effective than stand-alone, one-time offerings. Training professionals and volunteers to teach financial skills in non-formal settings has been shown to be effective outreach that leads to behavior change. Social service and other family-serving agencies see the financial challenges facing their clients, but are not prepared to help. Those who teach K-12 students often lack confidence and skills to teach financial literacy, a 21st Century skill identified in Iowa's curriculum standards. Iowa has a shortage of Volunteer Income Tax Assistance (VITA) sites, particularly in rural areas of the state.

What has been done

Professional development workshops, conference displays and media were used to make Iowa teachers aware of the High School Financial Planning Program (HSFPP) curriculum, a program of the National Endowment for Financial Education, and other evidence-based resources. 71 teachers requested HSFPP teaching materials to use in teaching 2,025 students. Additionally, 475 teachers visited conference displays and learned about vetted teaching resources. Extension trained 47 community volunteers who completed 1,278 tax returns at no cost to the income tax filers with low- and moderate incomes. Extension and Outreach educators taught 51 agency staff located in Iowa communities to use the Consumer Financial Protection Bureau's "Your Money, Your Goals" toolkit. Following 8 hours of training, local agency staff were armed with practical teaching tools to assist their clients with financial decisions.

Results

All Volunteer Income Tax Assistance (VITA) volunteers successfully completed IRS certification examinations and prepared 1,278 tax returns which resulted in \$737,228 Earned Income Tax Credit (EITC) refunds. VITA helps many Iowans with low- and moderate-incomes avoid tax preparation fees and secure sizable refunds that circulate in the local economy and bolster family financial well-being. Using pre- and post-surveys, 78% (36 of 46) increased their knowledge about personal finance and teaching tools appropriate to address specific client needs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #8

1. Outcome Measures

Utilize our Local Foods Program to provide skills training to incarcerated women in Iowa (number trained)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At the Iowa Correctional Institution for Women, Mitchellville, Iowa, Iowa State University is working with prison staff to train inmates how to farm and raise their own food for personal health and financial security, and possibly as a career, which can help prevent them from reoffending and contribute to the economic viability of Iowa. The additional skilled labor created through this program also addresses the perennial problem of the skilled labor shortage in Iowa's local foods economy.

What has been done

Along with landscape architecture faculty and students, our local foods program trained a rotating group of 40 women who were part of the 2017 prison garden crew. The participants learned how to plan, plant, maintain, and harvest a vegetable garden. The training program included both classroom sessions with extension staff as well as field training during the growing season. Grant funds were used to purchase grow lights and other equipment needed for starting seeds indoors for spring planting.

Results

The prison garden crew grew over 7,000 lbs. of vegetables in 2017, despite harsh weather conditions and the inability to effectively water throughout the growing season. The produce was used in the prison dining service. The 700 inmates and staff consumed the majority of the produce with very little waste, including 360 lbs. of baby salad greens, which staff predicted would not be eaten. The kitchen was inspired to try new recipes, including a new garlic dressing resulting in increased demand for items from the salad bar, stocked with many items grown in the prison garden. In the fall of 2017, three members of the garden crew were released from prison and got living wage jobs in the landscape/farming sector because of their garden training.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
802 Human Development and Family Well-Being

Outcome #9

1. Outcome Measures

Number of family-serving professionals receiving current, research-based information regarding factors that contribute to barriers to the physical and mental health of diverse, rural, low-income families

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rural communities and families continue to experience health inequalities when compared to their urban and suburban counterparts. Yet, there is a dearth of data on rural family health, especially data related to the health of diverse rural low-income families and the community and policy contexts they experience that shape their health and well-being.

What has been done

We integrated wave 1 with wave 2 interviews to provide a more thorough understanding of the barriers and enablers to health and well-being among rural, low-income families. Findings and implications related to health and well-being for rural, low-income families were shared with the public via 2 manuscripts, 1 research brief, and 8 conference presentations at national meetings reaching over 200 family-serving professionals.

Results

family-serving professionals received current, research-based information regarding the factors that contribute to or create barriers to the physical and mental health of diverse, rural, low-income families. Examples of findings: Lower health literacy was significantly associated with higher risk for depressive; alliance between parents is a critical aspect of rural mothers' social support system that may offset the negative impacts of poor health literacy on their mental health.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
802 Human Development and Family Well-Being

Outcome #10

1. Outcome Measures

Increased knowledge of mechanisms that have the potential to increase and enhance human health spans

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Each day 10,000 baby boomers turn 65--a trend expected to continue through 2030. The exponential growth of the older adult population coupled with increased aging-related needs poses challenges at the individual, family, community and societal levels. Thirty percent of older Iowans report a disability, many of which impede the older adults' ability to provide self-care and pose significant difficulties to living independently. Cognitive impairment and physical frailty in particular increase care needs, caregiver burden, and are significant predictors of long-term care placement.

What has been done

Using existing data from the Kuakini Honolulu Heart Program/ Honolulu-Asia Aging Study, Georgia Centenarian Study, and Exceptional Longevity Project, we researched prevention and intervention factors and methods that may promote cognitive health and prevent dementia in later life. The project team was actively involved with education of community members (older adults, families) and providers, as well as professionals in the field and state lawmakers.

Results

Our research and outreach work increased knowledge of the mechanisms underlying cognitive impairment and dementia; this knowledge can be used by researchers, caregivers and others to develop prevention and intervention techniques and policies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Local organizations have tight budgets, limiting opportunities to participate in trainings and implement programs offered by ISU Extension and Outreach. Although a few Extension and Outreach staff are bi-lingual, most lack proficiency in Spanish. Staff are also not proficient in other languages spoken by refugee populations from Burma and other countries. Staff have developed relationships with organizations that have staff who speak native languages of immigrant and refugee populations in Iowa to assist in program delivery.

A continued slow growth economy, stagnant wages, and limited job opportunities in rural communities constrain Iowans' ability to move up the economic ladder. Reductions in public services make it increasingly difficult for many Iowans to obtain information and to access resources. Rising costs of inputs and low commodity prices have driven farm incomes down, creating a negative ripple effect in rural communities.

One of the challenges of documenting impact of Extension and Outreach programs is the lack of funding for more rigorous evaluations. Lack of control or comparison groups limits the ability to address selection bias, discount alternative explanations of change, or pursue efforts to increase response rates.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

16,667 child care professionals successfully demonstrated increased knowledge gains in health and safety practices and child development. Pre/post survey data from the Juntos Para Una Mejor Educación (Together for a Better Education) program reveals that parents and youth significantly increased communication with each other about youth's goals for their future (N=197; p=.001). Parents became more confident in helping their youth graduate from high school and pursue higher education (N=107; p=.001). Youth increased communication with teachers about their progress in school (N=90; p=.05). Youth (N=90) who participated in components associated with the Juntos program reported decreased use of substances, and schools reported decreased incidences of tardies and absenteeism. Five Latino youth in one community who participated in Juntos in 2013 as 9th grade students have enrolled in college, one of the Latino youth graduates has been elected to the county Extension council, and three Latino parents who participated in Juntos in the same

community have completed their GED. Eleven former youth and adult Juntos participants volunteer to implement Juntos in their community

Evaluation of in-depth, sequential family finance programs yielded the following results:

*85% of participants surveyed during the last session of sequential financial management workshops reported improved financial practices;

*63% of participants surveyed during the last session of sequential financial management workshops reported making progress toward financial goals;

*78% of professionals and volunteers completing pre- and post-surveys during sequential workshops increased their perceived knowledge and skills to teach financial management to their clients; and

*Extension-sponsored rural Volunteer Income Tax Assistance (VITA) sites helped Iowans access more than \$700,000 in Earned Income Credits without paying tax preparation fees.

Key Items of Evaluation

The Essentials Child Care Preservice program provided 16,667 child care professionals with vital information on health and safety practices which leads to safer child care environments and improved health outcomes for young children. In turn, this benefits families and employers by reducing employee leave and creating a more stable workforce for Iowa communities. The Juntos Para Una Mejor Educación program has assisted 82 Latino families (326 youth and parents) increase communication with each other and strengthen family relations, be more confident in communicating with school staff, and take action to help youth graduate from high school and pursue higher education.

Nearly 2 in 3 participants in family financial workshops made progress toward personal financial goals.

Volunteer Income Tax Assistance (VITA) programs helped low-income Iowans access \$737,000 in refunded Earned Income Tax Credits, pushing many households out of poverty and bolstering financial security.

V(A). Planned Program (Summary)**Program # 3****1. Name of the Planned Program**

Food Security

 Reporting on this Program**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	20%		3%	
131	Alternative Uses of Land	4%		0%	
132	Weather and Climate	4%		1%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		15%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		11%	
205	Plant Management Systems	11%		4%	
212	Pathogens and Nematodes Affecting Plants	2%		16%	
215	Biological Control of Pests Affecting Plants	0%		10%	
216	Integrated Pest Management Systems	9%		3%	
301	Reproductive Performance of Animals	4%		1%	
302	Nutrient Utilization in Animals	4%		14%	
303	Genetic Improvement of Animals	4%		4%	
311	Animal Diseases	0%		5%	
401	Structures, Facilities, and General Purpose Farm Supplies	7%		0%	
402	Engineering Systems and Equipment	0%		10%	
405	Drainage and Irrigation Systems and Facilities	4%		0%	
601	Economics of Agricultural Production and Farm Management	8%		0%	
602	Business Management, Finance, and Taxation	7%		0%	
603	Market Economics	8%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	4%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	21.3	0.0	30.8	0.0
Actual Paid	26.2	0.0	33.0	0.0
Actual Volunteer	27.7	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3287299	0	5937752	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
3287299	0	5937752	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
8763783	0	44017958	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Continue to be a leading research institution on basic and applied questions impacting Iowa's ability to increase agricultural production capacity.
 - Proactively respond to legislative mandates by providing training and certification for livestock producers to ensure their continued operation and production of safe food products.
 - Maintain and strengthen extension education programs targeting Iowa farmers that develop their skills to evaluate and adopt emerging technologies, including regional food production and distribution, and best management practices.
 - Deliver business management resources that help farmers develop plans and procedures that support fiscally-sound operations.
 - Foster integrated research/extension teams to address issues facing Iowa farmers and assist with risk management when making decisions for their operations.
 - Educate producers, policy makers, and the public regarding the interaction between farming practices and water quality.
 - Assist farmers and landowners in adapting to the impacts of extreme weather fluctuations (drought and high temperatures and excessive and unseasonable rainfall) on crop and livestock production.
- Faculty participated in relevant multistate research committees: NC007, NC0140, NC0213, NC0246, NC1023, NC1029, NC1034, NC1170, NC1173, NC1177, NC1180, NC1182, NC1183, NC1184, NC1194, NC1197, NC1198, NC1201, NC1203, NC1442, NC2040, NE1020, NE1048, NE1227, NE1334, S1032, S1055, S1062, W2006, W2009, W2010, W3150, W3168, AND W3171.

2. Brief description of the target audience

- Agricultural producers and landowners in Iowa and the agribusinesses and agencies that interact with them
- Existing and beginning farmers are increasingly interested in producing value-added crops and livestock and market them in such a way as to retain a larger share of consumer expenditures on food
 - Processors, distributors, retailers and institutions interested in buying more locally produced food products
 - Agricultural professionals who serve farmers and influence their decisions regarding production and marketing options
 - Rural public health officials and service providers
 - State and federal agricultural and natural resource agencies, and environmental groups
 - Rural citizens and homeowners

Targeted audiences were those with whom research and education can make a difference, and who can benefit from and apply research-based information, such as those whose production systems have been affected by extreme weather, as well as those who consult or influence the decision-makers of these growers and producers. For example, audiences included farmers and landowners working to reduce the loss of nutrients to surface water using science-based strategies, and crop and livestock farmers impacted by drought or excessively wet conditions in 2017 and/or previous years.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	139110	2713	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017

Actual: 6

Patents listed

Plant Genes Involved in Nitrate Uptake and Metabolism. Schnable, et. al. Patent #9,523,099 issued 12/20/16.

Grain Mass Flow Estimation. Darr, et. al. Patent#9,702,753 issued 7/11/17.

Calibration of Grain Mass Measurement. Darr, et. al. Patent #9,645,006 issued 5/9/17.

Methods and Compositions Comprising Steroid Honey Bee Feeding Inhibitors. Jurenka, et. al. Patent #9,700,052 issued 7/11/17.

Multi-Sensor Crop Yield Determination. Darr, et. al. Patent #9,578,808 issued 2/28/17.

Foxtail Mosaic Virus-based Vectors for Gene Silencing and Gene Expression. Whitham et. al. Patent pending; filed 1/20/17.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	268

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of producers and agribusiness professionals who attended face-to-face educational activities, including individual consultations.

Year	Actual
2017	108142

Output #2

Output Measure

- Number of producers and agribusiness professionals who subscribed to newsletters and access web-based resources.

Year	Actual
2017	52600

Output #3

Output Measure

- Number of producers receiving ISU research based information from their ag retail or professional consultant.

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of producers or agribusiness professionals who gained knowledge in safe pesticide application through attending pesticide applicator Continuing Instructional courses or pesticide safety education programs.

Year	Actual
2017	24882

Output #5

Output Measure

- Number of local food producers attending extension programs.

Year	Actual
2017	3340

Output #6

Output Measure

- Number of popular press articles and publications authored by Extension specialists.

Year	Actual
2017	693

Output #7

Output Measure

- Number of lowans receiving food safety certification.

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of adult participants in Extension programs on food safety.

Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of visits on Iowa State University Extension and Outreach food safety project websites.

Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of meetings, contacts and one-on-one interactions with board members, policy makers

and other decision-makers.

Year	Actual
2017	1464

Output #11

Output Measure

- Number of "Food Security" extension publications that were distribute as downloads and printed materials.

Year	Actual
2017	1119470

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of producers indicating adoption of recommended practices.
2	Number of producers reporting increased dollar returns per unit of production.
3	Number of producers and landowners who adopt BMPs to address extreme weather events.
4	Number of increased efficiencies _____ (i.e. % pregnant; increases in yield/unit, such as bushels/acre; lbs product (meat, protein, milk) per animal; lbs feed per gain).
5	Number of beef cow-calf producers reporting increased knowledge of factors driving profitability of their operation
6	Number of livestock producers reporting increased knowledge of the new Veterinary Feed Directive and how to implement it
7	Percent of women who are farm operators and land owners participating in "Agronomy in the field" whose knowledge is increased
8	More Iowa farmers reached with education and consultations regarding farm finances. (percent increase)
9	Increase in participation in marketing-related programs (percent increase from previous year)
10	A "euthanasia management" program will be developed for swine producers.
11	Percent of producers indicating adoption of recommended practices to improve herd health, efficiency and profitability
12	Percent of producers implementing medication management to reduce antibiotic use
13	Percent of rural residents who research topics presented in the new Small Farms newsletter
14	Development of new crop health and disease management practices and/or treatments that can be successfully deployed in the Midwestern U.S.
15	Development of new methods of genetic transformation for crop species to ensure an adequate food supply
16	Increased knowledge of the genetic bases for resistance and immunity in poultry to avian diseases
17	Development of engineering solutions that support the sustainability of specialty crops in the Midwest

18	Establishment of the accuracy of observations of near-surface soil moisture, crops, and soil roughness made by microwave remote sensing instruments on current Earth-orbiting satellites at scales similar to Iowa counties (40 km) and townships (10 km).
19	Identification/new knowledge of suitable grape cultivars to maximize grapevine growth, production and processing in Iowa climatic and soil conditions
20	Increased knowledge of environmental and genetic determinants of seed quality and performance
21	Increased understanding of plant cell walls and their adjustments to environmental conditions
22	Increased knowledge of the current and potential severity and geographic extent of Western corn rootworm resistance to Bt technologies
23	Increased knowledge that can contribute to the development of environmentally safe strategies for insect pest management
24	Increase knowledge of nanoscale phenomena, to facilitate the development of better nano-based biosensors

Outcome #1

1. Outcome Measures

Number of producers indicating adoption of recommended practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2218

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. A major new weed problem is the introduction and spread of the invasive weed Palmer amaranth in Iowa. It was first discovered in 2013 in 5 southern Iowa counties, by fall 2017 it had been identified in 52 of Iowa's 99 counties. According to researchers at Kansas State University (Horak and Loughin, 2000), Palmer amaranth can reduce soybean yields by 78%. Because of the rapid spread and potential devastating yield loss, it was important to educate Iowa farmers and agribusiness professionals on identification and eradication strategies.

B. At least half of Iowa farmland is under some sort of leasing arrangement between farmland

owners and farm producer tenants. Many farm producers work with multiple farmland owners in these landowner/tenant relationships. After a peak in the statewide average for cash rents on corn and soybean acres of \$270 in 2013, it has declined each year since. Participant feedback from 2016 was used to plan the 2017 program. Topics of interest included communication between the leasing parties as well as communication and resources regarding the costs of crop production. Continued declines in farmland income and pressure on working capital have made renegotiating lease terms a concern for many financially strapped tenants. The program impacts an estimated 1.6 million acres of Iowa farmland as well as farmland in bordering states.

C. The cattle feeding industry is important to Iowa, ranking 4th in the U.S. More than any other state, Iowa has more than 900 feedlot operations that market more than 500 head of cattle annually. One factor important to the success of these operations is well trained employees in daily feeding management and animal care, in addition to staying up-to-date on the latest in technology and management information.

What has been done

A. With the increase of Palmer amaranth infestations across the state, and the growing concern of herbicide resistance and weed management, the topic was included in the statewide 2017 Crop Advantage Series conference. The keynote topic was, "Palmer Amaranth Identification and Management." Additional conference sessions topics included weed management updates and changes and improvements for the 2017 growing season. Nearly 2,000 farmers and agribusiness professionals attended the 14 Crop Advantage Series locations. Written proceedings provided summaries of the presentations and a handout was provided on how to identify Palmer amaranth.

B. Extension farm management field specialists prepared a 2.5 hour program and hosted a series of meetings for landowners and tenants, as well as farm managers and ag lenders. Program topics included: cost of crop production, leasing and land value trends, methods to improve communication, and how to implement conservation practices in leasing arrangements. A 100-page book with the latest and most relevant leasing publications was provided to all attendees. With increasing numbers of out-of-state landowners, educational videos and online publications provided other methods to access information on leasing topics.

C. A 3-day, intensive, hands-on short course was held that included demonstrations of feed mixing, bunk management, low stress cattle handling and acclimation and health management. Limited Restricted to 32 producers, the courses were conducted on Iowa State farms and a cooperating feedlot. All attendees received Beef Quality Assurance certification as part of the training. Of the attendees, 21 were feedlot managers, 9 were employees and 2 were veterinarians or consultants. The average feedlot size represented by the attendees was 4,700 and over 1 million cattle were influenced by the decisions of attendees either through direct management or consulting.

Results

A. Following the conference series, 630 surveys were sent via email; 30% responded. 235 participants reported they were now able to identify Palmer amaranth, 267 knew the threat posed by this weed, 261 now prioritize areas of risk for this weed, and 235 producers developed new management plans to address the issue. In addition, 146 increased scouting for this pest and 75 noted their increase in diversity of herbicide mode of action usage or increase residual herbicide rates to reduce risks of herbicide resistance developing. A total of 235 participants adopted recommended practices.

B. Ninety farmland leasing programs were attended by 2,171 participants in July and August

2016. The annual meetings had a high percentage of repeat attendees, with 59%/1,280 having attended at least once before. A post-program survey indicated that 91%/1954 would make a change to their lease agreements in the coming year as a result of attending a farmland leasing meeting. Participants noted these changes as decreasing rent, improving communications, implementing conservation strategies, and changing the type of lease. In addition, 43%/933 of participants indicated they attend the program to gain general leasing information, knowledge, and trends. Several comments mentioned the benefits of the leasing booklet and their intention to use it during their leasing conversations. A total of 1,954 participants adopted recommended practices.

C. Post-event survey results indicated that over 80% (25) of the attendees gained knowledge related to understanding and using feedlot data, nutritional management, receiving cattle health and nutrition, as well as feed bunk management and scoring. More than 90% (28) plan to change their feed bunk management approach, 70% (22) plan to change the way they collect and use data for decision making, and over 60% (19) plan to change their feed mixing management approach based on the information gathered at the short course. Over one half of the attendees plan to develop standard operating procedures for nutrition and management or health management as a result of their participation in the short course. Economic returns were expected to improve by at least \$10-15 per head for half of the attendees. At least half of the attendees also indicated that they anticipated improved cattle health and welfare. A total of 29 participants adopted recommended practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
205	Plant Management Systems
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
311	Animal Diseases
401	Structures, Facilities, and General Purpose Farm Supplies
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #2

1. Outcome Measures

Number of producers reporting increased dollar returns per unit of production.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of producers and landowners who adopt BMPs to address extreme weather events.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of increased efficiencies _____ (i.e. % pregnant; increases in yield/unit, such as bushels/acre; lbs product (meat, protein, milk) per animal; lbs feed per gain).

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of beef cow-calf producers reporting increased knowledge of factors driving profitability of their operation

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	121

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the developed world, consumers demand animal protein that tastes good, is cost-effective, and is sustainably produced. Efficient, economically viable beef production that translates to a high-quality, cost-effective protein source for consumers starts with the cow herd. Now, perhaps more than ever, it is prudent for beef cow-calf producers to hone their skills and enhance their knowledge as it relates to controlling costs without sacrificing productivity.

What has been done

In collaboration with allied industry partners, we conducted 10 meetings across Iowa. The program, "Improving Margins in the Cow-Calf Enterprise," focused on management practices that can control costs and increase return without sacrificing production. A total of 221 people attended the 3-hour meetings that included presentations, handouts and supplementary fact sheets pertaining to enhancing feeder cattle value and best management practices for wintering the cow herd.

Results

As a result of the program, 90% (116) of respondents indicated that their knowledge of the cow-calf economic outlook improved. Similarly, 94% (121) of participants indicated that their knowledge of factors that dictate profit was improved. More importantly, as a result of the program every respondent intended to implement at least one new management practice highlighted in the program. Specifically, ration balancing (70%/90), shifts in feed storage techniques (70%/90), altered feeding practices (50%/64), use of cover crops (62%/79), becoming BQA certified (51%/65), and changing marketing techniques (62%/79) were identified by producers as most likely practices to incorporate into their enterprise.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Number of livestock producers reporting increased knowledge of the new Veterinary Feed Directive and how to implement it

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	240

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

January 1, 2017 marked the implementation of the FDA's Veterinary Feed Directive (VFD) rules, enacted to slow the development of antibiotic resistance through increased oversight and judicious use of antibiotics deemed medically important in human medicine. The VFD rules require greater cooperation and communication among producers, veterinarians, and distributors. In order to appropriately use these antibiotics, protect animal health and wellbeing, and avoid regulatory action, it is critical that all parties are aware of their roles and responsibilities, and also understand the roles and responsibilities of the other involved parties.

What has been done

In the fall of 2017, the Iowa Beef Center conducted 11 face-to-face meetings across Iowa for livestock producers, veterinarians, and distributors of medicated feed. Meeting content included a general overview of the VFD rules, species breakouts, and discussion panels of producers, veterinarians, distributors. At some sites, Iowa Department of Agriculture and Land Stewardship inspectors also provided information. The program culminated in an online presentation, recorded for viewers to watch at their convenience.

Results

The meeting series was attended by 336 people and 240 responded to the post-meeting evaluations. All respondents acknowledged an increase in knowledge about the VFD regulations and record keeping requirements. When asked if they have a better understanding of which drugs and situations require a VFD, and what producer responsibilities are, 235 indicated they did. In addition, 232 indicated they have a better understanding of what to expect for VFD inspections and 230 know what to expect for enforcement. All evaluation respondents said they planned to improve communication with their veterinarian, improve their veterinary-client-patient relationship, and improve their record keeping. Of the responses, 228 planned to use antibiotics more judiciously, and 225 planned to reduce animal stress and disease pressure to reduce the need for antibiotics. In addition, 20 people viewed the webinar and 226 people have viewed the archived recording of that webinar. The VFD resource web page was viewed more than 3,100 times, and it continues to be available for public access.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #7

1. Outcome Measures

Percent of women who are farm operators and land owners participating in "Agronomy in the field" whose knowledge is increased

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	72

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the 2012 Ag Census, there are 32,167 women who are farm operators in Iowa, representing, 9,102,738 acres. Data indicates that 7,108 are listed as principal operators, representing 868,909 acres. Working with women landowners and farmers to increase knowledge of agronomic and conservation practices can increase the sustainability of farm systems by making them more economically and environmentally sound.

What has been done

Agronomy in the Field, a hands-on educational series for women who are farm operators, was held at 3 sites across Iowa, with a total 24 attending. The cohorts at three locations met once or twice a month throughout the growing season. Field-study topics included growing conditions, growth stages, weed, insect, and disease identification, scouting techniques, integrated pest management, cover crops, and soils. When the hands-on sessions were completed at the end of the summer, winter sessions conducted face-to-face, web conferencing or by archived web conference continued as requested by the participants.

Results

In the fall, participants were asked to rate their knowledge. Of the 134 completed surveys, 72% reported an increase in knowledge. The women were asked to rank how valuable the Agronomy in the Field sessions were to them, and 68% of respondents said highly valuable, 11% said mostly valuable, and 21% valuable. Participants reported that the sessions helped them gain confidence when having conversations with their spouse, farming partner, ag retailer, customers, or tenant. Additional comments from participants included that they have a better understanding of their tenant's perspective, gained confidence in making input decisions, feel more versed on basic agronomy skills, and skills will help them be a better advocate for agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
132	Weather and Climate
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants

Outcome #8

1. Outcome Measures

More Iowa farmers reached with education and consultations regarding farm finances. (percent increase)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	36

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa farm financial conditions have deteriorated since 2012, and multiple years of stress on working capital have created a difficult financial situation for many. While grain prices have fallen from the historic highs reached in 2012, input costs have not declined at the same rate. Financial data from the Iowa Farm Business Association shows the average loss in working capital across all farms in the sample amounted to \$123 per acre in 2015 and \$57 per acre in 2016, accumulating a \$180 per acre loss over the two-year period. Iowa State Extension receives frequent requests for information about "farm finances."

What has been done

A farm finance component was built into existing extension programs, including 90 farmland leasing meetings, 13 farm outlook programs, and 14 Crop Advantage Series events. The programs included details on an analysis of financial data from the Iowa Farm Business Association regarding factors that separate the top 20% of producers from the bottom 20% in farm finances. Available resources for financially stressed producers were also shared. Online materials were updated with the latest research and Farm Financial Standards Council guidelines.

Results

Farm financial resources were covered at over 117 extension programs across Iowa. A partial evaluation of farm outlook programs gave 65 responses from 389 total attendees. The 65 respondents indicated their knowledge of current financial conditions, or tight margins, increased from a 3.08 to a 4.05 on a scale of 1 to 5, 5 being highest. New or updated online resources included: 9 publications, 8 decision tool spreadsheets, 10 newsletter articles, and 2 videos. Six

farm financial associates, working part-time, spent 361 hours with clients doing one-on-one financial consultations, an increase of 36% from 2015. The new videos were viewed 794 times and the most popular financial publications were downloaded over 25,000 times.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #9

1. Outcome Measures

Increase in participation in marketing-related programs (percent increase from previous year)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	42

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Grain prices have steadily declined from historic highs, creating a need from farm producers and their advisors to return to the fundamentals of grain and livestock marketing. In 2016, the marketing average was the lowest since 2006, at \$3.30/bushel. Soybeans show a somewhat more positive picture with the 2016 average of \$9.34/bushel being slightly above the 2015 average received of \$8.91/bushel. Good yields, despite weather and disease pressure, have helped producers, but reinstating market fundamentals is imperative to the success of a farm operation going forward.

What has been done

Marketing is a complex topic, and the nuances of market cycles can make the concepts difficult to learn. Hearing information once is often not enough to implement change or understand all the components that go into a marketing plan. To address the complexity of the marketing topic, traditional delivery methods at large meetings and marketing clubs were used. In addition, videos and publications were reviewed, updated, and new materials were added to expand the information available through multiple outlets. Marketing club gatherings around the state

provided an environment to teach marketing fundamentals and allow participants to discuss marketing plans through the season with other producers.

Results

The number of participants in the marketing-related programs increased by 41.5% from the previous year, 3,831 to 5,422 at over 60 events. The programs ranged from large scale presentations (200 attendees) to smaller marketing club groups of 15-30 participants. Each of the 209 participants at eight marketing clubs developed a marketing plan for their operation. In this process they learned how to integrate crop insurance and mitigate risk for their farm business. Twenty-four marketing videos were made available. Views of the twenty-four videos increased 300% from the previous year and were viewed 14,993 times.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #10

1. Outcome Measures

A "euthanasia management" program will be developed for swine producers.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In October 2014, the Professional Animal Auditor Certification Organization (PAACO) certified a new, uniform swine audit platform for pork producers, packers and processors. In Iowa, the primary concern producers have with the new audit platform is their ability to address the comprehensive requirements. It is essential to their business that swine producers successfully pass an audit and maintain their ability to market animals. Following implementation of the audit training program, the need for additional training regarding euthanasia processes was identified.

What has been done

A euthanasia workshop has been developed and a pilot study was conducted in 2017. Following evaluation, the program will be launched in 2018.

Results

The workshop was presented to the 9-member educational committee of the Iowa Pork Producer Association. Additionally, a pilot workshop was attended by 26 producers and their input was used to modify the program so it can be launched in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #11

1. Outcome Measures

Percent of producers indicating adoption of recommended practices to improve herd health, efficiency and profitability

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

While the average age of primary farmers, including dairy, increased in Iowa, there is a subset of new and early career dairy farmers. These farmers express the challenges associated with startup costs, farm business analysis, understanding and implementing sound management practices and limited time to gain knowledge or interact with their peers and established dairy producers. Providing new farmer learning networks are important to help new and early career producers make sound dairy farm management decisions that are backed by current and relevant information to remain profitable and sustainable in the dairy industry.

What has been done

Extension specialists engaged 31 prospective new and early career dairy producers across the state. A series of seven, 2-hour workshops was developed and delivered using web conferencing technology distributed to four sites simultaneously. Three of the sites were at community colleges

offering dairy programs. Following the series, a set of on-farm tours and workshops was conducted. Pre/post learning evaluations were quantified for each topic presented. A post survey, conducted 6 weeks after the farm tours, evaluated implementation or changes in actions and conditions.

Results

Overall, 88-100% of the participants in the 36 workshops and events ranked the workshop as "high value." All workshops showed an increase in knowledge by the participants. The 6-week post survey indicated that 33% made changes in their operation in areas of calves and heifers, herd health, and records and 16% made changes in farm finances, nutrition, crop nutrient management, and human resource management. In addition, 50% plan to make changes in facilities, calves and heifers, herd health, and records, while 33% plan to make changes in dairy farm finances, nutrition, and human resource management. The participants also reported on the financial impact of these changes; 43% reported an impact of \$0-\$1000; 43% reported an impact of \$1000-\$5000; and 14% reported an impact of less than \$10,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #12

1. Outcome Measures

Percent of producers implementing medication management to reduce antibiotic use

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	42

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Concerns that excessive use of antibiotics in livestock is fostering antibiotic resistant infections in people prompted FDA to issue guidelines in 2013 partly aimed at reducing usage of drugs deemed medically important to promote animal growth. It is an issue of public concern. Training on judicious use of antibiotics is beneficial for consumer and producer. Consumers prefer less antibiotic usage and producers can improve profitability when using effective alternatives to antibiotics to maintain and improve herd health.

What has been done

Swine specialists developed and implemented an ongoing educational effort to educate producers on methods to improve judicious use of antibiotics. The programs emphasize understanding and implementing effective strategies in biosecurity, herd health, and proper antibiotic delivery techniques. Since 2015, Iowa State University's Iowa Pork Industry Center has awarded 1,635 Pork Quality Assurance (PQA) Plus and 812 Transport Quality Assurance (TQA) certifications, as well as 300 PQA Advisor certifications through workshops and online training. Regional swine meetings, in cooperation with the Iowa Pork Producers Association, focused on judicious use of antibiotics, through 3 workshops for 114 participants. Additionally, workshops have been developed and piloted to educate producers on strategies to maintain animal health thereby reducing the amount of antibiotics needed. Four specialized antibiotic reduction strategy workshops were held in 2017 for more than 50 producers.

Results

To assess the program's impact, a sample of 120 producers were surveyed six months following the workshops; 12 responded. Half of the respondents reported less antibiotic usage through improved herd health practices learned at the workshops. Of the survey responses, 20% indicated a change in antibiotic management and another 80% changed management practices such as hygiene and floor space to improve health resulting in reduced need for medication. One operation out of 12 reported a change in weaning age to reduce antibiotic usage. Also 42% reported antibiotic use reduction because of management decisions regarding medication timing. Another 33% shifted from mass treatment to more individual treatment thus reducing antibiotic use. The average estimated dollar value of the workshops reported per participant was \$1875. The survey results reflect the findings of a 2017 FDA report indicating that U.S. sales and distribution of antibiotics approved for use in food animals fell 10% in 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #13

1. Outcome Measures

Percent of rural residents who research topics presented in the new Small Farms newsletter

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa has approximately 18,000 farms under 50 acres. These rural clients are retired or working off-farm and need practical information available. The small farms program exists to connect these rural residents with practical information and extension specialists who can provide information in their area of expertise.

What has been done

A bi-monthly newsletter is distributed to more than 2,200 subscribers. Educational and informational articles include fruit and vegetable production, wildlife management, niche crops, livestock and more. Additionally, the Acreage Living newsletter serves as a communication vehicle for other agencies, the Department of Agriculture and Land Stewardship, NRCS and FSA, DNR, and Iowa Finance Authority, strengthening extension's partnerships with these service providers and benefiting Iowans.

Results

Since its inception in 2014, the Small Farms newsletter has included articles from more than 70 extension specialists, developing a new communication channel for them to reach new audiences. When surveyed, 54% (1,197) newsletter recipients indicated a topic presented in the newsletter prompted them to do further research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
311	Animal Diseases
401	Structures, Facilities, and General Purpose Farm Supplies
602	Business Management, Finance, and Taxation

Outcome #14

1. Outcome Measures

Development of new crop health and disease management practices and/or treatments that can be successfully deployed in the Midwestern U.S.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

U.S. food security and farm incomes depend on the continued advancement of the science of crop health and disease management.

What has been done

Field experiments were conducted in commercial farms in northwestern Iowa to evaluate effects of a biological control agent on disease control and yield improvement. Tests were made with commercial farming practices for corn production. Multiple diseases were suppressed after application including root rot and stalk rot of corn.

Results

After harvest, yield maps showed an increase up to 10 bushels per acre after treatment compared with control in all farms participating in our test. A farmer who participated in the test was excited with the results and would like to use this approach for disease management for all his acres in the coming season. Previously, he had used BCA in soybean to suppress white mold and for SDS control in a 50-acre field which had severe white mold over years. With the new treatment, he achieved a yield increase of 8 bushels per acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants

Outcome #15

1. Outcome Measures

Development of new methods of genetic transformation for crop species to ensure an adequate food supply

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Genetic improvement of many crops during the last 70 years has been due primarily to increased capacity to evaluate larger numbers of potential cultivars. Today commercial maize and soybean breeding programs evaluate millions of progeny annually to identify superior cultivars in half as much time as was needed 70 years ago. In the next 30 years, human population growth will result in demands for genetic improvements at a rate that is 3x current rates. These increased demands will occur at a time of climate change and increased costs.

B. Development of efficient and robust genetic transformation and genome editing technologies are critical to both basic and applied research in plant biology and agriculture. Most academic laboratories lack capacities in generating transgenic plants, especially for recalcitrant crop species such as corn and soybean.

What has been done

A. We conducted experiments and developed models to explore and demonstrate methods that can be used to rapidly deploy genes that enable plants to adapt to rapidly changing environments.

B. To address the issue, we conducted research to develop and improve methods of genetic transformation and genome-editing for crop species. The new and improved methods were then incorporated into transformation services provided to researchers in the biotechnology area, by Iowa State University Plant Transformation Facility (PTF).

Results

A. This project period, a novel experimental methodology was developed to improve the efficiencies of reverse genetic discovery experiments. (Reverse genetics attempts to connect a given genetic sequence with specific effects on the organism.) The methodology employed geometric models and computational algorithms and can be deployed as a smart phone app. Novel methods for predicting agronomic performance within and among environments were developed by integrating genomic prediction methods with crop modeling methods. Designs of genetic improvement projects, based on concepts from Game Theory and Markov Decision Processes, were shown to be at least four times as efficient as designs currently used for marker assisted selection.

B. As an indispensable infrastructure in plant research community, PTF has positively impacted research activities in the public sector, including establishing a CRISPR platform for efficient genome editing for maize. We continue to provide the public research community with a reliable and quality service for genetic transformation of corn, rice and soybean. We have also presented our findings at national and international conferences and in scientific journals. Our knowledge and information can be translated into products that will be beneficial to the industry and consumers. Finally, regulators and legislators can use our research on genome editing and risk assessment to establish policy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #16

1. Outcome Measures

Increased knowledge of the genetic bases for resistance and immunity in poultry to avian diseases

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Poultry products (eggs and meat) provide a major source of animal protein for human consumption; however, infectious disease reduces animal health and can jeopardize food safety. Commercial poultry breeders are showing interest in incorporation of molecular markers for health into their breeding programs, to improve accuracy of selection for traits contributing to animal health, welfare, and production efficiency, and food safety. Vaccine manufacturers are interested in the results of identification of biological pathways for host resistance, to help them develop more effective vaccines.

What has been done

We conducted research to characterize new relationships of genes and genomic regions with resistance to disease and to understand the relationship of the genetics of disease resistance and of production traits, and also their interaction with the environment. Additionally, we sought to understand the mechanisms by which genetic elements modulate birds' cells and cytokines that have a role in immunity and inflammation. We generated new knowledge of the genetic control of immunity and resistance to disease in chickens.

Results

Detailed knowledge of immune gene structure and functional genomics, and associations of SNPs and biomarkers with specific immune traits, will facilitate genetic selection to enhance innate disease resistance in poultry stocks. Analysis of the primary lymphoid tissues will give novel insights into the earliest transcriptional changes induced in immune-system cells in response to bacterial infections. Identifying crucial genes in biological response pathways will aid

in the design of vaccines, and in determining which genes or pathways are expected to have broad versus narrow protective effects. Information on the effect of certain feed additives and the immune response will aid their knowledgeable use in poultry production. Knowledge on the interactions of heat stress and inflammatory response may suggest methods for better management of poultry health in hot climates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #17

1. Outcome Measures

Development of engineering solutions that support the sustainability of specialty crops in the Midwest

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increased consumer demand for local foods will result in the development of local specialty crop markets. Expansion of local specialty crop production, however, is often constrained by low labor availability and high labor costs. Engineered sensors, electronics, and automation technologies offer the potential to revolutionize practices, address constraints to expanded local specialty crop production, and insure high food quality and safety.

What has been done

During this reporting year, we developed engineering solutions to address technical challenges in sensing, automation, and mechanization of specialty crop production. Specifically, we continued work on the robotic phenotyping systems, the sensing systems for crop and weed differentiation, the system integration and testing of the actuation system for mechanical intra-row weed control, the mechanism for cucurbit row cover establishment, drift control of chemical application, and the consistency of herbicide placement. Presentations were given to scientists, farmers, and industrial R&D representatives.

Results

The new knowledge generated by our research can be used to improve production efficiency, reduce reliance on a diminishing labor force, and reduce the environmental footprint caused by chemical applications in pest control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment

Outcome #18

1. Outcome Measures

Establishment of the accuracy of observations of near-surface soil moisture, crops, and soil roughness made by microwave remote sensing instruments on current Earth-orbiting satellites at scales similar to Iowa counties (40 km) and townships (10 km).

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Two Earth-observing satellites, NASA's Soil Moisture Active Passive (SMAP) and the European Space Agency's Soil Moisture and Ocean Salinity (SMOS), are exploratory science missions that will help establish regular space-based observations of soil moisture. In the future, satellite measurements of soil moisture will be used to improve weather and climate predictions. We know that the soil moisture values measured by SMAP and SMOS are "too dry" as compared to values recorded by a unique on-the-ground soil moisture monitoring network in Iowa.

What has been done

Researchers helped conduct an experiment in the Midwest to investigate. We hypothesized that soil surface "roughness," the cm-scale variations in the height of the soil surface caused by tillage, could be the problem. We have analyzed data from the experiment and have been able to confirm that measured roughness is higher than what is assumed by the SMAP and SMOS missions.

Results

This finding will help scientists correctly interpret the remote-sensing observations of SMAP and SMOS, produce satellite soil moisture measurements that are consistent with ground observations, and eventually improve weather and climate predictions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #19

1. Outcome Measures

Identification/new knowledge of suitable grape cultivars to maximize grapevine growth, production and processing in Iowa climatic and soil conditions

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New wine industries recently have developed throughout North America, including Iowa, under a vast array of climatic and soil conditions. Despite high grower interest, most states have only one small-fruit researcher, and many states have none. Research is needed to identify suitable grape cultivars to maximize grapevine growth, production and processing in Iowa.

What has been done

Three years of replicated field trials of new wine grape cultivars, assessment of findings, and selections of suitable grape cultivars. Research, demonstration, and extension work continued in the multi-state wine grape cultivar trial established at the Iowa State University Horticulture Research Station (ISUHRS).

Results

Results of our replicated field trials of new wine grape cultivars and selections assist grape growers and processors, extension and research specialists in viticulture and enology, and grape breeders in the selection of suitable grape cultivars and selection to maximize grapevine growth, production and processing in Iowa. New information learned in Iowa may be extended to other cold climate regions with cold winter temperatures and short growing seasons, typical of the

upper Midwest and northeastern United States.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #20

1. Outcome Measures

Increased knowledge of environmental and genetic determinants of seed quality and performance

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. U.S. agriculture is highly dependent on the quality of seeds utilized. Risk exposure to seeds that do not perform well under environmental stress is enormous, and could result in disruptive economic consequences accompanying yield reductions, fewer exports, higher food prices, and localized commodity shortages.

B. In 2005, the global market for seeds was estimated to be \$21 billion. Nearly all of the major seed companies have significant production and/or research facilities in Iowa. This industry is critical to agriculture worldwide as well as a critical component of the Iowa economy. Establishing a uniform and vigorous stand of seedlings forms the platform upon which yield is built. Seeds impact agronomic issues ranging from crop establishment to weed management, and are impacted by efforts to change grain composition.

What has been done

A. Research was conducted on the fluidity in soybean seeds. Using the chlorophyll-deficient mutants yellow-viable and yellow-lethal soybean seed originating from stress research, they were able to map the genetic differences between these mutants and the normal green phenotype. Both these genes are essential for energy synthesis and photosynthesis. Results of seed quality and health research were shared with collaborators from industry and the USDA.

B. We conducted research to increase our knowledge of the role of aconitase (an enzyme occurring in plant tissues) in energy formation. We isolated and characterized the Aconitase 4 gene which is essential for energy synthesis and photosynthesis. In addition, our research team determined soybean plant damage due to the detrimental effect of toxic nanoparticles in soils. And our research, on early defoliation in seed corn, determined, for the first time, that the seed corn industry may stop the normal development of the seed before physiological maturity without jeopardizing seed quality.

Results

A. Our cutting-edge research proved, for the first time, that new genotypic and phenotypic soybean forms can occur in one or two generations due to environmental stress. This game-changer phenomenon can be manipulated to accelerate adaptation to environmental stress, such as climate change. Our research increased knowledge regarding the key factors involved in the enhancement of seed quality, which can benefit the U.S. seed industry and those involved in producing and exporting seed at the global level.

B. Understanding the impacts of environmental stress, the role of aconitase in energy formation, the impact of defoliation on seed quality and delineating the development of herbicide resistance and seed dormancy will provide the basis for improving agriculture production stability in the face of environmental stresses such as those experienced as the result of climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #21

1. Outcome Measures

Increased understanding of plant cell walls and their adjustments to environmental conditions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Plant cell walls are an essential first layer of defense against environmental stresses and controlling plant growth and development. They also provide the raw materials for textiles, paper, lumber, films, thickeners and other products. Our understanding of the formation and modifications of cell walls and their adjustments to environmental conditions is fundamental to successfully creating plants with desired cell wall compositions and their efficient utilization for industrial applications, such as biofuels, biomaterials, feedstock, etc.

What has been done

We investigated the impact of cell wall post-synthetic modifications, potentially occurring during pathogenesis, on the plant signaling networks. In addition, we created and characterized new transgenic plants expressing microbial pectin methyl esterases (PME). These plants have dramatic dwarf phenotype and are able to accomplish complete development and produce seeds. These plants showed higher resistance to salt and unaltered susceptibility to fungal necrotroph *B. cinerea* (a fungus that affects many plant species). Transcriptome analyses revealed upregulation of a broad set of defense-related genes in PME expressing plants in comparison with wild type plants.

Results

Our cell wall research confirms that the specific cell wall modifications introduced in our transgenic plants initiate specific putative signaling pathways that can reveal, if characterized, potentially novel components of a plant's defense system involved in plant-pathogen interactions and in disease development. The new knowledge generated this period can be used to devise post-synthetic cell wall modifications to counteract degradation of cell walls and/or induce defense responses to biotic and abiotic stresses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #22

1. Outcome Measures

Increased knowledge of the current and potential severity and geographic extent of Western corn rootworm resistance to Bt technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2017 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Western corn rootworm are the most serious pests of corn in the U.S. Corn Belt. Each year U.S. farmers suffer economic losses in excess of one billion dollars, as a result of yield losses and management costs associated with corn rootworm. The challenges associated with management of this pest have increased over time due to the evolution of resistance to various management practices including crop rotation, conventional insecticides, and corn that produces insecticidal proteins derived from the bacterium *Bacillus thuringiensis* (Bt).

What has been done

As part of this project, extensive research has been conducted on resistance to Bt corn by western corn rootworm, using both laboratory-selected strains and strains with field-evolved resistance. Research on Bt resistance has included monitoring field populations for the development of resistance and measuring features associated with resistance, specifically inheritance and fitness costs, which enable scientists and regulators to estimate the spread and persistence of resistance in the landscape.

Results

Research and outreach conducted as part of this project has provided farmers with timely information on the effectiveness of current management tools for corn rootworm, policy makers and biotechnology companies with data on the long-term durability of Bt technologies for management of corn rootworm, and scientists with new information on interactions between corn and one of its primary agricultural pests.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants

Outcome #23

1. Outcome Measures

Increased knowledge that can contribute to the development of environmentally safe strategies for insect pest management

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2017

0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In recent years the number of available pesticides has declined as health, safety and environmental concerns have prompted authorities to restrict the use of toxic compounds in food and other agricultural products. This situation has led to the search for safe alternatives for the control of pest insects. Moths constitute one of the major groups of pest insects in agriculture. In many moth species, sexual behavior is dependent on the release of a unique blend of sex pheromones. The understanding of the molecular mechanism(s) responsible for pheromone production is crucial in order to devise ideal strategies for mating disruption, in order to cause moth populations to decline without use of toxic compounds.

What has been done

We conducted research to determine pheromone biosynthetic pathways in select moth species.

Results

We found that the terminal enzyme involved in producing aldehydes to found associated with the cuticle of the sex pheromone gland. The enzyme does not require any cofactors and is active in hexane. It will convert straight chain alcohols to aldehydes as well as several other branched alcohols. In other moths that produce acetate esters we have identified a putative acetyltransferase that transfers an acetate group from acetyl-CoA to an alcohol. This enzyme has been cloned and we are in the process of expressing it in a heterologous expression system to determine enzyme activity. Biochemically we have demonstrated that this enzyme will convert a fatty alcohol to an acetate ester in sex pheromone glands. This enzyme could be inhibited resulting in the disruption of sex pheromone communication. This research could lead to novel ways of inhibiting pheromone production in select female and male moths, providing an environmentally safe method of controlling pest populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants

Outcome #24

1. Outcome Measures

Increase knowledge of nanoscale phenomena, to facilitate the development of better nano-based biosensors

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a growing need, in the food, natural resource management, and other industries, for portable bio-sensing technology, such a handheld, smartphone-based biosensor that can detect the type and concentration of pathogens from myriads of food (fresh produce and meat) and water (waste and irrigation) samples. These biosensors must be designed and manufactured to be easy-to-use, all-in-one, and extremely sensitive (down to single cell level or picogram protein level).

What has been done

In this period, we evaluated production and presence of carbon nanoparticles in foods, and their fluorescence and bioluminescence properties. It furthered our understanding of naturally occurring nanoscale processes in food matrix which may lead to better utilization of these nano-phenomena. Results were presented to scientists, engineers and industry personnel, regarding various applications in agriculture, biological and biomedical engineering, chemistry, and environmental engineering.

Results

This project period we increased knowledge which can lead to advances in nanotechnologies to detect various pathogens faster and more accurately than current technologies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations
- Other (Consumer trends and preferences)

Brief Explanation

The invasion of Palmer amaranth into Iowa has focused education efforts on the

identification and management of this invasive weed. It is a close relative to the common Iowa weed, waterhemp, yet has the potential to cause much more damage to crop yield. With Palmer amaranth being so much more competitive than waterhemp it could have a significant economic impact due to higher weed management costs and greater yield losses.

Multiple years of lower farm profits have created a financial strain on many operations, resulting increased programming on farm management skills, marketing plan development and landowner/tenant agreements. These programs provide an unbiased information on current economic conditions and help producers hone their management skills.

New rules and regulations are impacting the livestock industry. In 2013, the Food and Drug Administration issued guidelines partly aimed at reducing usage of drugs deemed medically important to promote animal growth. Although livestock use of antibiotics is thought to minimally contribute to resistance, it remains an issue of public concern. January 1, 2017, marked the implementation of the FDA's Veterinary Feed Directive rules which require greater cooperation and communication among producers, veterinarians, and distributors. In order to appropriately use these antibiotics, protect animal health and wellbeing, and avoid regulatory action, it is critical that all parties are aware and understand their roles and responsibilities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Crop Advantage Series post-event surveys showed that 40% of the participants increased their knowledge about Palmer amaranth and will implement a behavior change. Responses indicate that they will change their management plan by increasing scouting efforts for Palmer amaranth and other weeds, implement timely herbicide applications, and use their improved identification skills. Of those surveyed, 75 commented that their future weed management programs will include diversified modes of action, residual herbicides or full rates of pre-emergent products.

In addition to measuring the effort of the farm financial resources and farm marketing plans, anecdotal evidence suggests that financially stressed farms are likely to have already tried a few or several strategies to improve their bottom line. One client shared, "You did a great job with your financial erosion presentation yesterday. You have a way of conveying the message in terms farmers understand and can relate to." "This helped me more understand what the farmers are dealing with." And online materials are used in various ways, including, "Used in loan writing and analysis of credit. Used to determine efficiency in farming operations and compare a client to averages." Evaluations also reported materials are used with an average of 100 other individuals beyond the initial user, either through classroom instruction, client consultations, or family discussions. The online educational materials were rated very or extremely useful by 90 percent of evaluation respondents.

Agronomy in the Field program participants responded to a post-program evaluation. When asked to rate the sessions on a scale of not valuable, somewhat valuable, valuable, mostly valuable, and highly valuable, 68% said highly valuable, 11% said mostly valuable, and 21% valuable. Some specific comments participants shared included: "This has been one of the most valuable groups and trainings that I have been a part of. I hope that we can keep this group in some form;" and "I attend a pretty good number of ISU Extension workshops and

this year I started attending field days. But this has been far and away the most useful I've attended...the sessions, the resources and tools provided, the follow-ups, etc. Just feel like I learned a lot in a relatively short amount of time."

Key Items of Evaluation

Because of the rapid spread of Palmer amaranth and potential devastating yield loss, it is important to educate Iowa farmers and agribusiness professionals on identification and eradication strategies. Continued programming and evaluation of participant learning will be ongoing focus of programming in the coming year. Evaluations will provide insight to participant knowledge and intent to change practices.

The Veterinarian Feed Directive curriculum trains producers on how to use antibiotics more appropriately thus protecting animal and human health and well-being. The program will also help producers comply with the new FDA regulations, avoiding regulatory action and protecting their livelihoods. While the program was focused on Iowa producers, visitors to the webinars and resource webpage came from out of state, broadening the impact.

Grain prices have steadily declined from historic highs, creating a need to return to the fundamentals of grain and livestock marketing. Good yields, despite weather and disease pressure, have helped producers, but reinstituting market fundamentals is imperative to the success of farm operations going forward. Learning the fundamentals of marketing and understanding market cycles can reduce stress and increase overall well-being of farm producers and agricultural professionals. Post program evaluations indicated the need for continued farm management programming.

V(A). Planned Program (Summary)**Program # 4****1. Name of the Planned Program**

Health and Well-being

 Reporting on this Program**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
307	Animal Management Systems	1%		2%	
308	Improved Animal Products (Before Harvest)	1%		0%	
315	Animal Welfare/Well-Being and Protection	2%		3%	
501	New and Improved Food Processing Technologies	1%		18%	
502	New and Improved Food Products	0%		9%	
503	Quality Maintenance in Storing and Marketing Food Products	17%		1%	
702	Requirements and Function of Nutrients and Other Food Components	0%		23%	
703	Nutrition Education and Behavior	33%		4%	
704	Nutrition and Hunger in the Population	12%		4%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	9%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	17%		8%	
721	Insects and Other Pests Affecting Humans	0%		2%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		2%	
723	Hazards to Human Health and Safety	7%		10%	
724	Healthy Lifestyle	0%		4%	
802	Human Development and Family Well-Being	0%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	4.9	0.0	1.4	0.0
Actual Paid	9.6	0.0	6.5	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
860617	0	1089072	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
860617	0	1089072	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
543915	0	5154850	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct workshops and meetings. Workshops include ServSafe® Certification food safety, food preservation, HACCP implementation, GAPS preparation, childcare provider training, etc.
- Develop educational materials, resources and curriculum including web based tools, social media and Extension publications.
- Provide training and technical assistance such as fundamental food safety training for volunteer staffed events, line level employees, and childcare providers, and respond to specific questions related to application of food safety principles.
- Provide nutrition and food resource management education through EFNEP and SNAP-Ed programs.
- Promote access to healthy food at food pantries.
- Facilitate community advocacy.

Faculty participated in relevant multistate research committees: NC1023, NC1194, NC2172, NE1439, NE1443, S1056, W3002, W3045, AND W3150.

2. Brief description of the target audience

- Food growers, foodservice management and staff in commercial and noncommercial operations
- School aged youth, child care providers, school staff and other adult mentors of youth.
- Adult Iowans in the workforce participating in food assistance programming and community health outreach programs.
- Consumers, and food stand volunteers
- Natural resource scientists and engineers
- Agribusiness
- Public health officials, state and federal agricultural, natural resource agencies and other policy makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	39314	1588170	809	37919

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
 Actual: 4

Patents listed

Peptide Domains that Bind Small Molecules of Industrial Significance. Rao. Patent #9,617,312 issued 4/11/2017.

Peptide Domains that Bind Small Molecules. Rao. Patent #9,695,217 issued 7/4/2017.

A Method for Optimizing Plastic Compositions Used in Packaging to Increase Shelf-Life of Perishable Products and a System Thereof. Vorst. Filed 4/19/2017.

Genetic Test and Genetic Basis for SCID in pigs. Dekkers, et. al. Patent #9,745,561 issued 8/29/2017.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	70

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of youth receiving educational programming related to nutrition, physical activity, and health promotion.

Year Actual

2017 40577

Output #2

Output Measure

- Number of adults who impact youth receiving educational programming related to nutrition, physical activity and health promotion.

Year	Actual
2017	3007

Output #3

Output Measure

- Number of adults receiving educational programming related to nutrition, physical activity, and health promotion.

Year	Actual
2017	340515

Output #4

Output Measure

- Number of professionals working with youth and/or adults receiving training related to nutrition, physical activity, and health promotion.

Year	Actual
2017	303

Output #5

Output Measure

- Number of unique visitors on Iowa State University Extension and Outreach nutrition/health websites and publication downloads.

Year	Actual
2017	641381

Output #6

Output Measure

- Number of lowans receiving education related to home food preservation.

Year	Actual
2017	3472

Output #7

Output Measure

- Number of lowans receiving food safety certification.

Year	Actual
2017	1777

Output #8

Output Measure

- Number of adult participants in Extension and Outreach programs on food safety.

Year	Actual
2017	12432

Output #9

Output Measure

- Number of unique visitors on Iowa State University Extension and Outreach food safety project websites.

Year	Actual
2017	107824

Output #10

Output Measure

- Number of food handlers receiving food safety training and education in safe food practices

Year	Actual
2017	10189

Output #11

Output Measure

- Number of print media interviews that furthered awareness of programming and services

Year	Actual
2017	17

Output #12

Output Measure

- Number of extension publications that focused on food safety topics that were distributed as downloads and printed materials

Year	Actual
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2017 749744

Output #13

Output Measure

- Number of people who attended open houses, presentations and informational meetings about dairy production in Iowa

Year	Actual
2017	4887

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percent of youth participants reporting increased knowledge/intake of vegetables.
2	Percent of youth participants reporting increased physical activity.
3	Percent of childcare training participants reporting preparedness to apply or teach health promoting dietary behaviors.
4	Percent of adults reporting increased fruit and vegetable intakes.
5	Percent of adults reporting increasing minutes of physical activity.
6	Percent of adult EFNEP/SNAP-Ed graduates who made a positive change in food resource management skills such as not running out of food.
7	Number of people receiving food safety certification.
8	Percent of adults reporting increased knowledge of safe home food preservation techniques.
9	Percent of adult EFNEP/SNAP-Ed graduates with a positive change in food safety practices.
10	Number of food handlers receiving food safety training and education in safe food practices.
11	Increased access to (pounds of) fresh fruits and vegetables for users of food pantries in Iowa
12	Number of cattle producers reporting increased knowledge of how to conduct a "Feedyard Assessment" to ensure a safe food product for consumers
13	Percent of youth participants reporting increased intake of fruits
14	Percent of youth participants reporting increased intake of vegetables
15	Percent of adults reporting increased vegetable intake
16	Percent of dietary professionals who report increased knowledge of dairy practices and dairy product safety
17	Percent of growers intending to develop a food safety plan specific to their operation

18	Percent of food manufacturers intending to make changes in their operation to impact food safety
19	Percent of adults reporting increased knowledge of safe home food preservation techniques
20	Increased knowledge of linkages among economic hardship, stress exposure, food insecurity and health outcomes across the lifespan
21	Increased knowledge and improvement of tools that support the safety and quality of grains, oilseeds, and their processed products
22	Increased understanding of consumer acceptability and knowledge of the health benefits of beans
23	Increased knowledge of the biology, ecology and management of emerging disease vectors in Iowa

Outcome #1

1. Outcome Measures

Percent of youth participants reporting increased knowledge/intake of vegetables.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Percent of youth participants reporting increased physical activity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	29

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The 2015 Dietary Guidelines for Americans recommend 60 minutes of active play every day for children. The 2014 Iowa Youth Survey data show that just 30% of 6th grade youth in Iowa

indicate being active for 60 minutes per day over the past week.

What has been done

Beginning in 2016, our Expanded Food and Nutrition Education Program (EFNEP) began delivering the "Kids in the Kitchen" youth nutrition and cooking education program. The program is delivered in two counties with particularly high populations of children from families with low income. The seven-lesson series provides basic nutrition and food safety education as well as basic cooking skills for children in grades K-5. The lessons are delivered outside of school time in after-school programs and summer enrichment or childcare settings. Each lesson includes a period of active play that can be replicated outside of the lesson environment. The lessons and activities stress the notion that active play does not have to involve organized sports, but can be whatever types of activity the child enjoys.

Results

Twenty-nine percent (29%) of Kids in the Kitchen participants in grades 3-5 reported increased physical activity. It is worth noting that 70% of children indicated they were active on most days or every day at program entry. This ceiling effect limits the ability to show change using the required youth EFNEP tool. Iowa State University is part of a national committee interested in improving the youth EFNEP evaluation processes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #3

1. Outcome Measures

Percent of childcare training participants reporting preparedness to apply or teach health promoting dietary behaviors.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	75

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dietary and physical activity behaviors can be established as early as 2-4 years of age. Informing child care providers of appropriate food and physical activity behaviors is essential to early childhood development.

What has been done

Childcare training was provided to 1,246 childcare providers in Iowa.

Results

Approximately 75% of participants reported preparedness to make changes in their own childcare settings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #4

1. Outcome Measures

Percent of adults reporting increased fruit and vegetable intakes.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Percent of adults reporting increasing minutes of physical activity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	47

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The 2015 Dietary Guidelines for Americans recommend that adults participate in moderate

physical activity for 30 minutes per day on 5 days per week. The 2015 Behavioral Risk Factor Surveillance System data show that 19.4% of adult Iowans meet aerobic and strength physical activity recommendations. For those with an income below \$15,000, just 14.1% meet aerobic and strength physical activity recommendation.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of 9, 10, or 11 nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age 18 and under as well as pregnant or parenting teens. These lessons show participants how to choose nutritious foods, stretch their food dollars, handle food safely, be physically active, and prepare nutritious recipes. Each lesson has a physical activity component. In particular, Lesson 2, Get Moving, focuses on physical activity.

Results

Following participation in at least eight lessons, 47% of participants increased the amount of physical activity in which they regularly participate. In addition, by the completion of the program, 74% of participants reported meeting the physical activity recommendations set by the 2015 Dietary Guidelines for Americans.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #6

1. Outcome Measures

Percent of adult EFNEP/SNAP-Ed graduates who made a positive change in food resource management skills such as not running out of food.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	86

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Effective food resource management is critical to healthy eating behaviors among families with low-incomes. Whether their food resources consist of public benefits or earned income, families

need to build skills to maximize available resources to gain the most nutrition for their dollar. Nearly 13% of Iowans are food insecure.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of 9, 10, or 11 lessons taught by paraprofessional nutrition educators to families with low income and children age 18 and under as well as pregnant or parenting teens. These lessons show participants how to choose nutritious foods, stretch their food dollars, handle food safely, be physically active, and prepare nutritious recipes. Participating families learn shopping and meal planning strategies that minimize waste and stretch expensive ingredients.

Results

Among families graduating from the EFNEP and SNAP-Ed lesson series, 86% improved their food resource management. This data point is measured through questions related to frequency of planning meals, comparing prices, using a grocery list and running out of food at the end of the month.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #7

1. Outcome Measures

Number of people receiving food safety certification.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1777

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is estimated that 48 million people experience a foodborne illness each year with 3,000 deaths resulting from these illnesses. Providing food handlers and decision makers involved in food preparation and service with knowledge about risks can help in reducing incidents of foodborne illness by leading to better practices.

What has been done

More than 2,000 Iowans (n = 2,133) participated in an 8-hour workshop about safe food handling practices.

Results

Of the 2,133 who participated in the 8-hour certification course workshop, 83.3% (n = 1,777) were successful in earning certification as Certified Food Protection Managers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #8

1. Outcome Measures

Percent of adults reporting increased knowledge of safe home food preservation techniques.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #9

1. Outcome Measures

Percent of adult EFNEP/SNAP-Ed graduates with a positive change in food safety practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	68

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Previous EFNEP and SNAP-Ed data show that families with low income do not, seldom, or sometimes (as opposed to most of the time or almost always) practice food safety management skills such as thawing and storing food properly. These are skills that can prevent or alleviate illness.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of 9, 10, or 11 lessons taught by paraprofessional nutrition educators to families with low income and children age 18 and under as well as pregnant or parenting teens. These lessons show participants how to choose nutritious foods, stretch their food dollars, handle food safely, be physically active, and prepare nutritious recipes. Each lesson includes a component related to food safety with particular focus on minimizing food waste without compromising food safety.

Results

At entry to the program, 16.5% of program participants demonstrated acceptable food safety practices (i.e. thawing and storing foods properly). Following participation in at least eight lessons, 68% of adult participants reported improved food safety practices (i.e. thawing and storing foods properly).

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #10

1. Outcome Measures

Number of food handlers receiving food safety training and education in safe food practices.

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Increased access to (pounds of) fresh fruits and vegetables for users of food pantries in Iowa

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	229841

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nearly 13% of Iowa's population is food insecure. According to a 2014 Feeding America study conducted with Iowa food pantry clients, the most desired item by pantry clients that was not available was fresh produce. Iowans of all income levels eat fewer fruits and vegetables than recommended and consumption is lowest among those with low income.

What has been done

In 2015, our Master Gardener Program began partnering with SNAP-Education to a) provide education about food insecurity, b) offer mini grants to support volunteer food security projects,

and c) donate produce from model demonstration gardens. In 2017, we awarded mini grants to 15 counties and six demonstration gardens were planted at Iowa State research farms. Mini grant funding helped provide materials and mileage reimbursement to volunteers who grew produce for food pantry donations. Additionally, ISU Extension and Outreach's SNAP-Ed program partnered with Grow Johnson County and Table to Table Food Rescue to increase access to fruits and vegetables in food pantries in Southeast Iowa.

Results

From the Master Gardeners, a total of 74,841 pounds of fruits and vegetables were donated and distributed to more than 75 locations across Iowa. The donations provided nearly 225,000 servings of fruits and vegetables for families with low income. In all, 231 Master Gardeners volunteered time to help grow the produce. Another 457 people volunteered to assist Master Gardeners with their work. Additionally, the partnership with Table to Table led to more than 155,000 pounds of fruits and vegetables distributed through food pantries, for a total distribution of 229,841 lbs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

Outcome #12

1. Outcome Measures

Number of cattle producers reporting increased knowledge of how to conduct a "Feedyard Assessment" to ensure a safe food product for consumers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	203

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Consumers are concerned about how their food is produced, and producers and packers are building confidence of consumers. By participating in the Beef Quality Assurance program and completing a feedyard assessment, producers position their business to ensure safe, wholesome and quality beef for consumers. It demonstrates that cattle producers are concerned about the product they produce as well as the live animals in their care. The BQA Feedyard Assessment is a review of employee training, standard operating procedures, record keeping, animal health

protocols, handling practices, and equipment/facility maintenance, plus a tool to identify areas of potential risk or opportunities for improvement.

What has been done

Seven on-farm workshops were held in 2016 and 2017. The workshops objectives were to inform cattle feeders on the steps to complete the Feedyard Assessment, certify participants in the BQA program, and encourage participants to complete the Feedyard Assessment on their own operation. Four topics were covered: feed bunk and water management, mud and manure scoring of pens and animals, Veterinary Feed Directive, and animal handling and processing. The workshops were attended by 203 producers and agri-business professionals.

Results

To ascertain learning and future behavior, an end-of-meeting evaluation was completed by 203 attendees. One hundred percent of the responses indicated that participants agreed with the importance of the feedyard self-assessment, the workshop increased their knowledge of and ability to complete the feed-yard assessment, they planned to conduct the self-assessment for their feedyard, and they all were comfortable completing it themselves. Participants at the workshops planned to share information with over 650 other people.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #13

1. Outcome Measures

Percent of youth participants reporting increased intake of fruits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The 2014 Iowa Youth Survey data show that only 8% of 6th graders statewide consumed fruit daily (not counting fruit juice). Fruit and vegetable consumption in Iowa among all ages is well below recommendations.

What has been done

Beginning in 2016, Iowa State University EFNEP began delivering the Kids in the Kitchen youth nutrition and cooking education program. The program is delivered in two counties with particularly high populations of children from families with low incomes. The seven-lesson series provides basic nutrition and food safety education as well as fundamental cooking skills for children in grades K-5. The lessons are delivered outside of school time in after-school programs and summer enrichment or child care settings.

Results

Self-reported behavior is measured with older program participants (grades 3-5) and 25% indicated increased fruit consumption. One challenge with measuring impact of this program is a high rate of ideal responses at program entry when using the required youth EFNEP tool.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #14

1. Outcome Measures

Percent of youth participants reporting increased intake of vegetables

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	27

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The 2014 Iowa Youth Survey data show that only 6% of youth ate green salad, carrots, potatoes or other vegetables (not counting French fries, fried potatoes, or potato chips) on a daily basis. Vegetable consumption is critical to a healthy diet and Iowa youth show significant room for improvement.

What has been done

Beginning in 2016, Iowa State University EFNEP began delivering the Kids in the Kitchen youth nutrition and cooking education program. The program is delivered in two counties with particularly high populations of children from families with low incomes. The seven-lesson series provides basic nutrition and food safety education as well as fundamental cooking skills for children in grades K-5. The lessons are delivered outside of school time in after-school programs and summer enrichment or child care settings.

Results

Self-reported behavior is measured with older program participants (grades 3-5) and 27% indicated increased vegetable consumption. One challenge with measuring impact of this program is a high rate of ideal responses at program entry when using the required youth EFNEP tool.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #15

1. Outcome Measures

Percent of adults reporting increased vegetable intake

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Current program data show that at entry EFNEP and SNAP-Ed clients consumed 1.6 cups of vegetables, which is below the Dietary Guidelines for Americans recommendation of 2.5 cups

daily. Vegetables are important sources of many nutrients including dietary fiber, potassium, vitamin A, vitamin C and Vitamin K.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of 9, 10, or 11 nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age 10 and under as well as pregnant or parenting teens. These lessons teach participants how to choose nutritious foods, stretch their food dollars, handle food safely, be physically active, and prepare nutritious recipes. Lessons 3 through 8 all focus on practicing healthy nutrition behaviors: Fruits and Veggies: Half Your Plate, Make Half Your Grains Whole, Build Strong Bones, Go Lean with Protein, and Make a Change (addresses sodium, fats, and added sugars).

Results

Following participation in at least eight lessons, 46% of participants increased their consumption of vegetables. On average, combined vegetable consumption among EFNEP and SNAP-Ed graduates increased by 0.3 cups.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #16

1. Outcome Measures

Percent of dietary professionals who report increased knowledge of dairy practices and dairy product safety

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	79

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

While there is a wide variety of highly nutritious, safe, and affordable dairy products that meet and exceed all milk quality standards and tests, labeling can be confusing to consumers. Consumers may also have concerns and questions of how their food is produced, farm sustainability, dairy product quality and safety, as well as the quality, safety and assurance of animal well-being.

Often, grocery store dairy managers, health professionals, and in-store dietary staff are the front-line source of information and product recommendation for consumers. Many of these in-store professionals have never been exposed to agriculture, farms, or the production systems and practices that provide the dairy products, nor are they familiar with consumer attitudes and their basis for product selection.

What has been done

Five all-day dairy retail academies, including on-farm and milk processing plant tours, presentations on dairy practices, dairy sustainability, animal health and well-being, and dairy products quality and safety, were conducted for dairy grocer case managers, in-store dieticians and health professionals and the community sustainability writing committee of an international dairy company by the extension programs at Iowa State and South Dakota State University, along with Midwest Dairy Association. Pre and post tests on attendee understanding of dairy facts and knowledge were conducted as well as a personal satisfaction survey.

Results

Post event surveys from 225 respondents indicated that 100% ranked the academies as a highly effective educational event with highly credible, understandable source of dairy practices and information. Of the participants, dairy grocery case managers rated the academy as the most highly effective educational training of their careers and they had greater understanding of dairy practices and sustainability following their participation. In addition, 100% of the managers and 100% of the dieticians stated they have greater understanding of dairy practices and dairy farm operations and that they would share the information with their peers and clients. Evaluation results from all participants showed a 79% knowledge increase and 91% indicated they had extreme comfort in answering questions regarding dairy practices and sustainability. Participants in the academies estimated that they provide information to 400-600+ persons/year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection
503	Quality Maintenance in Storing and Marketing Food Products
703	Nutrition Education and Behavior
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #17

1. Outcome Measures

Percent of growers intending to develop a food safety plan specific to their operation

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	55

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Centers for Disease Control and Prevention reported that an estimated 48 million people, 1 in 6, US residents suffer from food-borne illness each year. Of those, 128,000 are hospitalized and 3,000 die from food-borne illnesses. Between 1998 and 2008, 46% of all food-borne illnesses reported were associated with fruits, vegetables and nuts. The CDC also reported that in 2010 and 2011, about one-third of the major, multi-state outbreaks were associated with fresh produce. There is a need for education and technical assistance to produce growers to ensure the food supply is safe.

What has been done

Extension planned and conducted food safety trainings for produce growers participating throughout Iowa. In addition to educating participants on best management practices for food safety, components of developing a food safety plan, required by the FDA, were also introduced. To complement the face-to-face training sessions, other resources were developed and distributed including online resources, extension publications, flipcharts and videos.

Results

Five produce grower food safety trainings were attended by 73 growers; 93% responded to pre- and post-assessments. Assessment results show changes in the following areas: food safety plan utilization from 8% pre-assessment to 55% post-assessment; effective water use from 23% pre-assessment to 71% post-assessment; good sanitation practices from 42% pre-assessment to 87% post-assessment; and measures to prevent cross contamination from 50% pre-assessment to 82% post-assessment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #18

1. Outcome Measures

Percent of food manufacturers intending to make changes in their operation to impact food safety

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	97

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Centers for Disease Control and Prevention reported that an estimated 48 million people, 1 in 6, US residents suffer from food-borne illness each year. Of those, 128,000 are hospitalized and 3,000 die from food-borne illnesses. There are an estimated 30,000 food manufacturing companies in the U.S. that employ over 1.5 million people which supply Americans food every day. There is a great need to ensure that education and training is occurring with these companies to ensure that the U.S. food supply is safe.

What has been done

Iowa State University teaches two courses to Iowa-based companies and provides technical assistance to ensure that food manufacturers in Iowa are contributing safe and wholesome food products. The courses were developed by the Food Safety Preventive Controls Alliance (FSPCA). The programs assist companies producing human and animal food in complying with the preventive controls regulations that will be part of the Food Safety Modernization Act (FSMA).

Results

Two courses for human food were conducted in partnership with the Center for Industrial Research and Service. The courses were attended by 102 participants representing 64 companies. Post-event evaluations indicated that many participants intend to make changes in their operations, with 97% indicating that they will make immediate changes based on the information received. One participant stated, "This training will greatly help our company update our food safety plan and comply with the necessary standards and procedures."

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from

	Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #19

1. Outcome Measures

Percent of adults reporting increased knowledge of safe home food preservation techniques

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Interest in home food preservation has increased due to the local foods movement and the economy. According to the National Center on Home Food Preservation, 1 in 5 U.S. households can their own food; however, many are unaware of the food safety issues that home food preservation encompasses.

What has been done

Of the 3,472 people who received food preservation assistance, 537 adults participated in food preservation education programming. Of these 537 adults, 80 completed the statewide comprehensive food preservation program and 457 attended a general food preservation class. Additionally, 2,912 individuals called with food preservation questions.

Results

Of those who took part in the online food preservation lessons, all (100%) reported an increase in "high to very high" post knowledge about canning processing times, foodborne illness (e.g. causes, high risk foods), safe food handling practices, and recommended canning practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and

723 Naturally Occurring Toxins
Hazards to Human Health and Safety

Outcome #20

1. Outcome Measures

Increased knowledge of linkages among economic hardship, stress exposure, food insecurity and health outcomes across the lifespan

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Child and adolescent obesity in low income and minority families, and specifically economic hardship is associated with stress and health outcomes across the lifespan of American children, adolescents, and adults.

What has been done

Researchers conducted analyses examining the antecedents for the development of obesity in adulthood, by utilizing Wells' Maternal Capital hypothesis. In addition, we explored how one specific measure of economic hardship, food insecurity, may exacerbate these associations. Results of this research were shared with several hundred researchers, extension educators, and professionals in the field as well as health administrators, policy makers and the public.

Results

We increased knowledge regarding the antecedents of child, adolescent, and adult health outcomes. Family-serving professionals who received this new knowledge can use it to help reduce child, adolescent, and adult health problems in at-risk families in America.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #21

1. Outcome Measures

Increased knowledge and improvement of tools that support the safety and quality of grains, oilseeds, and their processed products

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

About 48 million people in the U.S. (1 in 6) get sick, 128,000 are hospitalized, and 3,000 die each year from foodborne diseases, according to recent data from the Centers for Disease Control and Prevention. Advances in biotechnology and heightened awareness of food safety have presented new and larger challenges in marketing and delivery of quality grains and bioprocess coproducts. New challenges come over the backdrop of steadily increasing total grain volume with the related pressure on grain management infrastructure.

What has been done

Six near infrared spectroscopy (NIRS) manufacturers had their equipment calibrated for various grain and grain product analyses by the ISU grain quality laboratory. The laboratory analyzed over 13,000 corn and soybean samples for 55 different clients. A cost model of mycotoxin testing in high-throughput commodity facilities was done. A characterization of distillers dried grains with solubles (DDGS) mass flow rate was completed at different drying and storage conditions. A checklist was created to assist feed and food processors to comply with the Food Safety Modernization Act (FSMA). Training programs were delivered to over 500 grain industry professionals.

Results

Measurement protocols for grains, oilseeds, and distillers' grains were improved, facilitating a more comprehensive, rapid assessment of quality attributes. Improved costing models gave merchandisers and processors better tools for characterizing cereal grains and oilseeds for targeted uses in the feed and grain supply chain. Training programs increased the knowledge of 150 grain industry professionals of how to effectively control grain dust and manage food safety controls in the grain elevator. Ten Preventive Control Qualified Individual (PCQI) courses provided 352 industry and regulatory personnel with practical training in animal food safety, which

directly supports FSMA compliance. An Ames, Iowa-based company has begun the development of supporting services and training for ethanol plant operators using models and data collected by our ISU Grain Laboratory.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #22

1. Outcome Measures

Increased understanding of consumer acceptability and knowledge of the health benefits of beans

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The *Phaseolus vulgaris* L. species of the legume family have high genetic diversity, climate adaptability, disease resistance, and multiple human health benefits. Consumer acceptance studies are needed to better understand food intake choices and to justify the expansion of these important crops into marginal lands. In Iowa, the growing Hispanic population poses service challenges for public health and extension services because they may be isolated by language, geography, and poverty. There is also little information on bean consumption, acculturation, self-efficacy, and food security, among Hispanics.

What has been done

We conducted a survey and analyzed the findings of that survey of low-income women, with an oversampling for Latinas. This knowledge was shared with county extension agents and agency leads at low-income health clinics where we collected the data.

Results

This increased our knowledge of our audience's level of food insecurity, acculturation, knowledge of health benefits of legumes, and legume consumption patterns. In addition, it allowed us to identify knowledge gaps. Our findings will continue to be used to inform the educational efforts of extension and public health professionals. to provide education regarding nutritious food products that promote human health and well-being.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #23

1. Outcome Measures

Increased knowledge of the biology, ecology and management of emerging disease vectors in Iowa

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Aedes aegypti and *Ae. albopictus* mosquitoes, primary vectors of dengue and chikungunya viruses, were detected in California, USA, in 2015. The threat of potential local transmission of these viruses increases as more infected travelers arrive from affected areas. It is of great importance to understand the biology and mechanisms of disease transmission in mosquito populations. The aims of this project seek to participate in a research network in which information and resources are freely shared to better study arthropod vectors and the diseases that they carry.

What has been done

In response, we conducted mosquito surveillance across Iowa, focusing our efforts on the potential invasion or establishment of *Ae. aegypti* and *Ae. albopictus*. After sampling ~7,400 mosquitoes using either BG Sentinel or Gravid Aedes traps across participating counties, *Ae. albopictus* were collected in three counties. In two counties in southeast Iowa, *Ae. albopictus* were identified at multiple trap sites spread across several miles. They were often found in residential areas without known focal points of introduction.

Results

The widespread abundance of these mosquitoes support the argument that they may have become established in these areas. We worked closely with local and state public health officials, as well as media outlets, to inform and educate people of the mosquito-borne disease transmission. Results were also shared with other members of the Upper Midwest Center of Excellence in Vector Borne Disease, initiating conversations of vector-borne disease surveillance outside of traditional state borders. Our research and outreach directly influenced the public health of the citizens of the state of Iowa.

4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans
722	Zoonotic Diseases and Parasites Affecting Humans

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (loss of staff; growing demand for more programming via technology)

Brief Explanation

Economic constraints continue to influence program planning and participation rates. Citizens and organizations may wish to participate in programs but lack resources of time and transportation. There continues to be competition for some audiences. For example, the number of child care providers attending decreased this year due to state mandated Essentials Child Care training, also provided through Extension. Thus, programming numbers for this program have decreased, but another program showed positive change. Further, a regional grocery store chain with Registered Dietitians in each store now competes for some of the same audiences as ISU Extension and Outreach.

There is a growing demand for more programming via technology. In response ISU Extension and Outreach has designed several websites and social media pages as well as managing or partnering on three mobile apps. The State Fair Food Finder and Seasonal and Simple apps are partnership efforts with the Des Moines Register and University of Missouri, Kansas State University, and University of Nebraska, respectively. Educational materials are available in online formats, such as streaming videos, to meet the needs of Iowans. We have increased cross-postings for related materials. For example, information for consumers about thermometers links to "how to use thermometers" videos on the Spend Smart, Eat Smart; Food Safety; and Nutrition and Health websites. ISU Extension and Outreach is examining novel strategies to capture impact of technology-enhanced delivery methods. The challenge with the use of technology, specifically social media, is the ability to document impact. ISU Extension and Outreach continues to examine options to provide

impact measures, not merely 'views or likes' for social media efforts.

The Food Safety Modernization Act has raised awareness about risks from improper handling of food along the food chain, particularly proposed standards related to fresh produce. Specialists in the College of Human Sciences work with those in College of Agriculture and Life Sciences to provide programing related to fresh produce safety, in face-to-face and online formats.

Iowa demographics continue to change. This provides opportunities to create and deliver programming that is sensitive to diverse cultures. Economic challenges and increasing numbers of New Iowans led to investigation by food entrepreneurs of ways to grow food-based businesses, with a corresponding effort to offer text and Spanish language educational materials. ISU Extension and Outreach offered 10 ServSafe® classes in Spanish this past year, reaching 70 participants throughout the state. Further, fact sheets targeted to those considering or starting home food operations and home bakeries in Iowa were provided. A pilot workshop for home food operations and home bakeries is in the development stage and will be disseminated in the spring of 2018.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The high pass rates (83.3%) on the national ServSafe® certification exam and food preservation knowledge surveys indicate that the ISU Extension and Outreach food safety programs have led to increases in knowledge, with the ultimate goal of indicating changes in behavior. Increases in numbers of Iowans participating in food safety programming, beyond the targets, indicates there is considerable interest in improving safe food handling practices across the food chain.

EFNEP and SNAP-Ed participants showed strong behavior change this year with nearly half of participants increasing consumption of fruits or vegetables. Participants also demonstrated strong improvements on critical health and nutrition measures including physical activity, food resource management and food safety practices.

Food safety programs assess participants with pre- and post-evaluations and follow-up surveys to identify changes in knowledge, intentions to take action, and changes in behaviors and practices. Evaluation examples: printed survey distributed to attendees at dairy day events measured participant trust in the dairy industry; online surveys for food safety training helped identify; and self-assessments distributed by the Iowa Beef Center reinforce the importance and value of standard operating procedures, written records, animal traceability, and scoring systems, all based on best management practices.

Key Items of Evaluation

Childcare training participant surveys were collected post-training and entered into the online system for statewide analysis. There were 83 child care providers who participated in food safety certification programs with 78% (n = 65) earning the Certified Food Protection Manager Credential. The number of those taking part in food preservation programming are key evaluation indicators for food safety programs. Food preservation programming is assessed using a post-pre evaluation method.

Master Gardeners donated a total of 74,841 pounds of fruits and vegetables, which were

distributed to more than 75 food pantries across Iowa. The donations provided nearly 225,000 servings of fruits and vegetables for families with low income. In all, 231 Master Gardeners volunteered time to help grow the produce. Another 457 people volunteered to assist Master Gardeners with their work. The success of the program through ISU Extension and Outreach is being noticed by other universities. The University of Wisconsin, Purdue University and the University of Nebraska are finishing their first year with similar SNAP-Ed funded programs. Additionally, the partnership with Table to Table led to more than 155,000 pounds of fruits and vegetables distributed through food pantries, for a total distribution of 229,841 lbs.

Post-event evaluations at dairy retail academies for grocery chains showed participant knowledge of dairy product management practices significantly increased from 79% to 94%. Also, 100% of dairy grocer case managers and in-store dieticians stated they would utilize the provided materials and education with their clients (400-600+ persons/year) and 91% felt very comfortable in presenting information about dairy products and practices. Overall, all participants have a greater understanding and appreciation for modern dairy farms and their practices and their role in providing high quality, safe and affordable dairy products.

V(A). Planned Program (Summary)**Program # 5****1. Name of the Planned Program**

Natural Resources and Environmental Stewardship

 Reporting on this Program**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	6%		6%	
102	Soil, Plant, Water, Nutrient Relationships	11%		22%	
111	Conservation and Efficient Use of Water	5%		3%	
112	Watershed Protection and Management	6%		14%	
121	Management of Range Resources	5%		2%	
123	Management and Sustainability of Forest Resources	2%		2%	
124	Urban Forestry	0%		1%	
125	Agroforestry	2%		0%	
131	Alternative Uses of Land	6%		2%	
132	Weather and Climate	4%		2%	
133	Pollution Prevention and Mitigation	6%		2%	
134	Outdoor Recreation	5%		2%	
135	Aquatic and Terrestrial Wildlife	4%		21%	
136	Conservation of Biological Diversity	4%		12%	
141	Air Resource Protection and Management	4%		2%	
311	Animal Diseases	0%		1%	
403	Waste Disposal, Recycling, and Reuse	5%		0%	
405	Drainage and Irrigation Systems and Facilities	10%		3%	
605	Natural Resource and Environmental Economics	10%		2%	
608	Community Resource Planning and Development	5%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	15.6	0.0	7.0	0.0
Actual Paid	14.2	0.0	13.6	0.0
Actual Volunteer	27.7	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1778744	0	2199857	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1778744	0	2199857	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3177190	0	10629508	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The following basic to applied research activities will allow for attainment of the program goals.

- Addressed air and water quality, and other environmental issues of Iowa through research, education, and extension programs targeted at solving environmental problems of producers, citizens, public health officials, and regulators.
- Increased research and adoption of best management conservation practices, crops, and cropping systems that control soil erosion, minimize sediment transport, and reduce nutrient export.
- Approached water quality and quantity issues from a watershed perspective using adaptive management principles that link the private and public sectors.
- Developed better models and tools to be used to evaluate the effects of changes in the mix and location of crop and livestock systems due to climate change and the impacts of those changes on native plants and animals (wildlands and wildlife).
- Targeted programming to address policy issues as they arose, including response to public comment documents and development of hard copy materials and resources for regulators and policy makers.
- Produced, updated and revised handbooks, newsletters, and publications on a variety of topics including nutrient management, soil health/erosion, and commercial horticulture crop production.
- Developed and delivered strategies and programs to increase community involvement, especially related to private and public natural resources.

Faculty participated in relevant multistate research committees: NC0213, NC0507, NC1173, NC1178, NC1180, NC1181, NC1182, NC1189, NC1190, NC1195, NC1198, NE1438, NE1442, S1032, S1053, S1063, S1065, W0506, W2006, W3004, W3045, W3128, W3133, and W3188.

2. Brief description of the target audience

This program focuses on the private and public sectors. Stakeholders engaged with research and extension activities associated with this program include: crop and livestock producers, private citizens,

public health officials, state and federal agricultural and natural resource agencies, environmental groups, landowners, homeowners, agricultural and natural resource scientists and engineers, agribusinesses, and policy makers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	111653	5909	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	108

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of producers, agribusiness professionals, and land-owners who attend face-to-face educational activities, including individual consultations.

Year	Actual
2017	84235

Output #2

Output Measure

- Number of producers, agribusiness professionals and land-owners who subscribe to newsletters and access web-based resources.

Year	Actual
2017	246002

Output #3

Output Measure

- Number of research articles, technical papers and journal articles that outline the research and best management practices for nutrient management practices.

Year	Actual
2017	693

Output #4

Output Measure

- Number of consumers who engage with extension programs and specialists on social media, including video

Year	Actual
2017	292653

Output #5

Output Measure

- Number of Natural Resources and Environmental Stewardship extension publications that were distributed as downloads and printed materials

Year	Actual
2017	22631

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of acres where the adoption of BMPs, Nutrient Reduction Strategy and conservation practices were implemented.
2	Number of producers increasing the efficiency of manure and crop nutrient utilization while minimizing surface run-off and preserving ground water quality.
3	Number of acres where improved drainage designs were implemented
4	Number of landowners implementing practices to improve pasture productivity and economic returns
5	Number of turfgrass managers intending to implement changes in best management practices to protect the environment
6	Identification of resilient landscape and horticultural production systems and management practices for adoption in the state of Iowa
7	Increased knowledge that can lead to the widespread acceptance and adoption of methods for valuating ecosystem goods and services
8	Increased knowledge of factors affecting aquatic ecosystems in agriculturally impacted landscapes throughout Iowa
9	Percent increase of Iowa producers who have implemented stockpiled grazing
10	Increased understanding of key wildlife population processes that can be used to more effectively manage wildlife populations
11	Increased knowledge of nitrogen utilization in corn-based cropping systems
12	Increased understanding of how to control poultry respiratory diseases in the U.S.

Outcome #1

1. Outcome Measures

Number of acres where the adoption of BMPs, Nutrient Reduction Strategy and conservation practices were implemented.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	517217

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Soil erosion and nutrient loss are major problems facing Iowa farmers as 2 out of every 3 acres in the state is in row crop production. Eroded sediment, along with nutrients, is a source of pollution in Iowa streams and rivers. Reducing soil erosion and nutrient loss will maintain the long term production of Iowa farmland, improve water quality for Iowans, and improve water quality in the Mississippi and Missouri Rivers.

B. Fertilizer expenses tend to be the second or third largest cash cost in farm operations. While the timeliness of soil testing fields has somewhat improved, interpreting and understanding the research-based university recommendations to maximize profits still eludes many farmers. Knowing how to sample soils and manure, interpret soil and manure tests, determine crop nutrient needs to maximize profitability of their operations and reduce nutrient loading risks to the environment is important to farm business operations.

What has been done

A. Iowa State University Extension and Outreach, with the Iowa Learning Farms, provided farmers with needed information on cover crops, conservation tillage, and conservation drainage through partnerships with NRCS, agribusinesses and extension programming. Topics included water quality benefits of cover crops, improving soil with cover crops, managing cover crops, utilizing no-till and strip-till, Iowa Nutrient Reduction Strategy, controlled and shallow drainage, and use of wetlands and bio-reactors for nitrate reduction.

B. ISU Extension and Outreach developed a crop nutrient management education program for beginning and experienced farmers. A field agronomist in northeast Iowa offered 28 workshops to help 288 clients learn how to maximize economic returns related to crop nutrient expenses. The workshops were targeted to beginning to experienced farmers, state and county employees

working as crop nutrient management advisors, and NRCS/SWCD staff. The workshops were 2-hour small-group hands-on sessions using real-life scenarios with current soil tests, Iowa State nutrient recommendations, and present-day fertilizer processes. A 30-page self-help manual was given to each participant for future use.

Results

A. In 2017, farmers attending Iowa Learning Farms field days reported they implemented no-till/strip till on 79,546 acres, of which 7,758 were new acres, and fall seeded cover crops on 38,258 acres, of which 12,203 were new acres. Attendees also reported that they had seeded 513 acres of prairie strips within row crop fields. When RUSLE2 workshop participants were asked if they will use training to develop nutrient management plans, 25 indicated they would, impacting 343,000 acres.

B. When surveyed, 82% of the 167 respondents indicated that they have a sufficient understanding of fertilizer recommendations and they are more knowledgeable about their fertilizer purchases when speaking with their agricultural provider. The surveys showed these conversations resulted in a reduction of farmer fertilizer purchases by an average of \$17 per acre. Farmers in attendance represented about 100,000 acres in their operations, and surveys showed that more than half the acres (55,900) had these practices implemented. More importantly, is an improvement in prioritizing fertilizer applications on fields most in need and reducing applications on fields with adequate fertility levels. Survey results show that 90% of livestock operators now sample manure on an annual basis and 84% of these farmers improved their procedures on how manure samples are collected. In addition, 61% of livestock operators have reduced commercial fertilizer purchases by an average of \$24 per acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

Number of producers increasing the efficiency of manure and crop nutrient utilization while minimizing surface run-off and preserving ground water quality.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	900

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Manure from livestock farms can be an economic and environmental asset if properly applied to crop fields. When manure is mishandled or over applied, it becomes a liability contaminating the environment. Proper application of manure provides a win-win opportunity to minimize crop input costs while optimizing crop production and protecting the environment.

What has been done

Iowa State University Extension helped farmers learn how to manage their manure by distributing information, assisting with manure management plans, and providing education in the Manure Certification Program. Research results presented demonstrate how careful application of manure provides optimal crop nutrients and protects the soil, water and air. The program also reviews past environmental spill incidents to help farmers learn to be proactive. The Manure Applicator Certification program was presented to over 2,240 manure applicators in Iowa at 67 face-to-face meetings. DVD viewings were also offered.

Results

Iowa farmers are using the knowledge gained from manure applicator training, along with available technology and equipment, to optimize manure applications in protecting the water, soil, and air and to improve worker safety. When asked, 900, of the 2,240 attendees reported they were likely or very likely to change how they based their nitrogen application rates. In addition, 828 farmers indicated the information would be useful to them in their operation and 630 of the farmers reported they were likely or very likely to begin using hydrogen sulfide monitors to improve worker safety. In follow up surveys of the participants, farmers reported on current practices and plans to reduce negative environmental impacts on over 175,000 acres.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

Number of acres where improved drainage designs were implemented

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	51772

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agricultural farm drainage is becoming increasingly important due to the critical role it plays for Iowa's crop production systems. Drainage systems that are optimally designed and operating are essential to achieving excellent agricultural production capability while addressing potential water quality concerns. Stakeholders looking to install a new drainage system or retrofit an existing system have requested training on design concepts, economics, water quality and quantity management, and legal issues related to drainage.

What has been done

Iowa State University Extension and Outreach initiated the Iowa Drainage School to educate stakeholders on sub-surface drainage concepts customized to the upper Midwestern states. Since 2007, 335 participants, consisting of contractors, engineers, drainage planners, land owners, farmers, agency staff, and drainage district supervisors, have attended the school. The school has been a collaborative effort between University of Missouri, University of Minnesota, and South Dakota State University, USDA-NRCS, and various industry partners.

Results

All participants completing an end-of-school evaluation have ranked the school good (45%) or excellent (55%). Participants reported that they make drainage decisions on over 1,100 acres per participant. In addition, an email survey was sent to 207 contacts to measure the educational efforts of the drainage program over the past 10 years. Responses were received from 34% or 74 participants. As a result of the training received, 45%/33 indicated an increase in the number of clients they served, 35%/25 of the respondents indicated they had hired additional staff, and 39%/28 indicated they purchased additional equipment to manage the additional work acquired. Respondents reported they developed an average of 373 drainage designs each year, with an average project size of 312 acres. Of the new designs, 63% were developed by the respondents using knowledge gained: sizing laterals and mains, installation depths, outlet sizing, inclusion of a

drainage coefficient, and use of lateral spacing. As a result of their knowledge gained from the program, participants report that approximately two-thirds of the designs they develop get implemented, indicating that approximately 51,722 acres annually are receiving drainage design improvements.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

Number of landowners implementing practices to improve pasture productivity and economic returns

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	960

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Because Iowa forage and pastureland acres have been in steady decline since the 1930s, capitalizing on forage production is critical to Iowa's beef operations. Efficient grazing management has the potential to reduce cow herd feed costs around \$1 per cow per day, significantly improving profitability. Pasture management also has a role in protecting water quality, improving nutrient distribution, and benefiting soil health. While the conversion of Iowa forage land to row crop production has leveled off in recent years, from 2007 to 2012 Iowa lost 21% of its pasture ground, forcing Iowa beef producers to manage more cows on fewer acres. With fewer forage resources available, Iowa beef producers must improve forage land productivity and management to maintain beef cow inventory.

What has been done

From 2012 to 2017, the Iowa Beef Center hosted more than 100 grazing programs attended by nearly 1,200 producers. Programs included pasture walks, state-wide conferences and multi-

session series on grazing management. More than 50 pasture walks were held on farms featuring unique aspects of pasture management. Grazing series included: 5-session, beginner-level greenhorn grazing program held at 11 locations; 3-session, intermediate-level grassroots grazing program, co-sponsored with NRCS, offered at 10 locations; and 4-session advanced-level certified grazers program held at 9 locations.

Results

Participants in all forage programs were surveyed in the fall of 2017 to determine practices they have adopted or plan to adopt as a result of their participation. When surveyed, 960 of 1200 respondents indicated that pasture productivity was increased by improvements made based on objectives learned at an extension forage program. Of the responses, 504 increased pasture productivity 10-20% and 396 said productivity increased more than 30%. In addition, more than 600 noted economic return of at least a \$500 because of their participation. Not only were almost 1,200 producers impacted by an extension pasture or grazing program, but at least one component of the program was shared by attendees to an additional 1,300 people. Of those who responded to the post-event survey, 396 improved their ability to identify and manage tall fescue, 372 modified weed control and 372 developed watering systems. In addition, 288 implemented a grazing plan or re-established or renovated existing pasture, with more than 240 planning to do so in the future. Survey responses also indicated that 32%/384 have incorporated cover crops into their grazing plan and 408 implemented pasture condition scoring.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

Outcome #5

1. Outcome Measures

Number of turfgrass managers intending to implement changes in best management practices to protect the environment

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	119

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Ensuring best management practices for turfgrass are followed is critical to protecting the environment. A sound set of best management practices will ensure the safe use of pesticides, limit fertility applications to only the amount the plant will take up, and still allow for an aesthetically pleasing surface. Instituting extensive best management practices will also limit wasteful irrigation, and save on water use through irrigation management practices. Knowing that BMPs are being followed will help commercial turfgrass managers with explanations of why various management practices are necessary in communications with the public.

What has been done

Presentations were made during 2017 with lawn care professionals, sports turf managers, and golf course superintendents on best management practices for each segment of the turfgrass industry. The Iowa Golf Course Superintendents Association has used these presentations and publications to build a BMP plan for Iowa with input from an extension turfgrass specialist.

Results

The Iowa Turfgrass Conference was attended by 264 turfgrass managers and 119 indicated they would change their management plans based on what they learned at the conference sessions. In addition, many commercial turfgrass managers indicated that they plan to reduce inputs in the upcoming year and perform irrigation audits to ensure water is not wasted. Additionally, several commercial turfgrass managers are changing turfgrass cultivars or species to help lower inputs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
134	Outdoor Recreation

Outcome #6

1. Outcome Measures

Identification of resilient landscape and horticultural production systems and management practices for adoption in the state of Iowa

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Based on current needs of the horticultural industry in the Midwestern United States and on input from stakeholders in the State of Iowa, our research focuses on sustainable landscape and horticultural production systems. A changing environment has resulted in the need for an increased understanding of the basic mechanisms that govern the environmental adaptation of horticultural plants.

What has been done

An athletic field research facility and an athletic field trafficker device to simulate athletic field traffic were constructed, which will continue to significantly increase our ability to conduct research to improve the safety and performance of natural grass athletic fields. Research included these studies and more: turfgrass species as alternatives to Kentucky bluegrass for better water use efficiency; traffic tolerance and survivability of several new, cold hardy bermudagrasses cultivars; the physiology of spring deacclimation in 3 Rosaceae species and 10 azaleas cultivars, etc. Results were shared with scientists and the turfgrass industry via presentations at meetings, trade shows, and our turfgrass blog.

Results

Some sports turf managers are now using more cold-tolerant bermudagrasses or tall fescues in place of Kentucky bluegrass. New knowledge was obtained on the effect of natural products derived from the grain and biofuel industry on turfgrass response. Research on the use of wetting agents on turfgrass demonstrated its potential in reducing irrigation needs for sports turf managers while still providing a surface that does not have an elevated surface hardness. Research on three Rosaceae species revealed findings that may facilitate the development of plant cultivars that are more resilient to climate changes. Comparative studies between Rhododendron species advanced fundamental understanding of the role of light-stress-tolerance in winter survival by broad-leaved evergreens. We established a highly efficient gene editing protocol for switchgrass for the first time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry

Outcome #7

1. Outcome Measures

Increased knowledge that can lead to the widespread acceptance and adoption of methods for valuating ecosystem goods and services

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Valuation of ecosystem goods and services is essential for informing efficient and effective public policy with regard to public land, water resources, air quality, and many other natural assets. However, estimating benefits of these nonmarket goods and services remains challenging.

What has been done

We examined the sensitivity of recreational benefit estimates to the metric used to measure water quality, investigated the consistency of consumer preferences over time, developed a new modeling technique to incorporate omitted sites in recreational demand models, outlined the history and current state of knowledge for integrated assessment models of air and water pollution, and developed an integrated assessment model of water pollution in the Upper Mississippi and Ohio Tennessee watersheds.

Results

Over the course of this project, we have improved the theoretical underpinnings and empirical methodologies used to measure these benefits. Particular impacts include: 1) published findings that will help inform policy makers of the implications of using various water quality metrics for cost-benefit analyses; 2) increased knowledge regarding economic valuation of water quality improvements; 3) increased knowledge of how certain economic models help inform both ex ante and ex post analyses of federal, state, and local regulations; and 4) we developed an integrated assessment model of water pollution in the Upper Mississippi and Ohio Tennessee watersheds. This model will help analyze land use and water quality policies that affect a wide range of water uses such as drinking water and water-based recreational use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
131	Alternative Uses of Land
134	Outdoor Recreation

Outcome #8

1. Outcome Measures

Increased knowledge of factors affecting aquatic ecosystems in agriculturally impacted landscapes throughout Iowa

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa has a large number of aquatic resources that provide substantial economic, recreational, and ecological benefits. However, aquatic resources are constantly threatened by numerous anthropocentric stressors, including agriculture, which can result in negative effects on these systems. Understanding how external factors influence the structure and function of these systems is an important component to their successful management.

What has been done

Fish populations were collected in wetlands, lakes, rivers, and reservoirs throughout Iowa and population were calculated to identify population dynamics. Fish community information was then coupled with existing land use, water quality, and climate data to assess external influences on fisheries. Water quality variables (e.g., total phosphorus, total Kjeldahl nitrogen, Secchi depth, chlorophyll a, turbidity, etc), contaminants (e.g., pesticides, heavy metals), benthic macroinvertebrates, and fish assemblage information were collected from wetlands, lakes, and reservoirs or obtained from existing databases. Existing land use information was merged with the database and interrelationships among water quality, invertebrate assemblages, and fish populations were assessed with multivariate analyses.

Results

This 5-year project produced an increase in knowledge for the project director, 10 graduate students, 29 undergraduate mentees, and natural resource managers at the state and federal level in these areas: 1) ecology and management of invasive fishes in the Mississippi River basin, 2) awareness of wetland importance, quality and pesticides contamination, 3) identification of ecosystem restoration effects on wetland quality and fish populations to improve future restorations, 4) mercury contamination levels in fishes throughout Iowa to guide Iowa DNR human consumption advisories, 5) improved understanding of walleye stocking success, and 6) potential

effects of angling on sport fish populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #9

1. Outcome Measures

Percent increase of Iowa producers who have implemented stockpiled grazing

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

While forage-based production systems are recognized to provide ecological services, such as carbon sequestration and wildlife habitat, grassland acres in Iowa have decreased at a rate of 21.3% during the last decade primarily because of an inability to economically compete with row crop production systems and other land uses. The loss of grazing lands increased production costs for beef cow-calf producers, making beef cow-calf production difficult to sustain for current producers and to begin for new farmers.

What has been done

Research was conducted to assess if grazing lands could be increased by strategic grazing of grasslands enrolled in governmental programs or under private ownership. The research demonstrated that strategic use of rotational, strip or mob grazing would increase the percentage of legume forage species while reducing soil compaction and enteric methane emissions by cattle in grasslands, but did not affect soil organic matter or water infiltration. A single mob grazing event in mid-summer produced comparable yields and nutritional quality of stockpiled forage for winter grazing as a hay harvest.

Results

From the results of this research, 87% of private landowners stated in a survey that they would allow short-term grazing to improve wildlife habitat and 79% of beef cow-calf producers would move cattle up to 10 miles for 45 days of grazing. Increasing stocking density through high density strip grazing will increase amount of grazing land per animal and tends to decrease enteric methane production per cow. The costs of harvesting and feeding stored hay to cows can be reduced by winter grazing of pasture forage stockpiled after mob-grazing in early August. Increasing profitability of grazing would be important to all beef cow-calf producers, but would be particularly valuable for beginning producers. Change in Actions: As a result, there has been a 60% increase in the number of producers who have implemented stockpiled grazing and an additional 88% indicated that they planned to implement this management in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity

Outcome #10

1. Outcome Measures

Increased understanding of key wildlife population processes that can be used to more effectively manage wildlife populations

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Studies of the ecology of many wildlife species, and how individual species interact with each other, are of great interest to wildlife and conservation biologists interested in their management or conservation. As human population growth continues, many native communities will become increasingly threatened and there will be an even greater need for managing rare and declining species. Needed are sound, science-based solutions to many of the problems encountered when managing wildlife populations for a wide range of uses such as biodiversity conservation, sustainable harvest, or others.

What has been done

We conducted field studies (observation and experimental) and population modeling to forecast wildlife responses to environmental stressors, changes in harvest regulations, and other factors of interest to natural resource managers.

Results

Work increased knowledge of the current status of wildlife populations, estimates of wildlife diversity and abundance, and how wildlife species and communities respond to management and conservation actions. The group's work resulted in a change in action in these areas: involvement with Iowa Department of Natural Resources committees that will continue to inform the Iowa Wildlife Action Plan to guide long-term management of Iowa's natural resources, changes to stocking strategies of federally endangered Kootenai River White Sturgeon, proposed changes to Iowa's waterfowl breeding surveys that are used to allocate federal funds for habitat restoration, recommendations of release strategies of burbot in Idaho, and recommendations to the U.S. Army Corps of Engineers on how to better manage water levels in flood storage reservoirs to benefit waterbirds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #11

1. Outcome Measures

Increased knowledge of nitrogen utilization in corn-based cropping systems

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Understanding the soil supply of crop available nitrogen for corn production is critical for furthering our knowledge of corn nitrogen fertilization needs, refinement of fertilization guidelines, and improvement in fertilizer nitrogen use efficiency.

What has been done

We continued analyzing a robust data set with 56 site-years of N response trials from around the North Central region. It is being analyzed for N response and factors that may predict response. We continued investigation of a model to be used to improve or supplement current N rate recommendations. We used our research findings to improve corn nitrogen (N) rate guidelines, Extension and Outreach publications, and the online Corn Nitrogen Rate Calculator.

Results

Improvements to the guidelines, extension publications, and Corn Nitrogen Rate Calculator, will aid producers in adjusting N applications to corn production fields, which, in turn, can improve producer profitability and reduce potential for nitrate movement to water systems. Also, our research provided an improved understanding of the relationship between proper soil fertility management, N fertilizer use efficiency, and soil health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #12

1. Outcome Measures

Increased understanding of how to control poultry respiratory diseases in the U.S.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The ability of pathogens to jump into new host species can have catastrophic impacts for animals on both sides of the wildlife-domestic interface. *Mycoplasma Gallisepticum*, a pathogen of both poultry and some wild songbirds, provides one of the best-documented, most-tractable model systems to understand the ecology of diseases at this interface.

What has been done

We conducted field and lab experiments to better understand how physiological and behavioral differences among wild hosts might facilitate pathogen spread in the wild and potential jumps to domestic poultry. Experiments currently underway are testing how these differences impact

pathogen spread through a group.

Results

Our research increased knowledge of the incidence of *M. gallisepticum* (a chronic respiratory disease) in Iowa house finches; and it increased understanding of why, mechanistically, individuals differ in their responses to infection. Increased understanding of infection risks and impacts can help hobbyists and commercial producers develop best practices for biosafety. This research also showed that although *M. gallisepticum* is likely present in Iowa house finches at levels comparable with other regions, and that exposure to *M. gallisepticum* is common among backyard chickens, finches are unlikely to be playing a major role in that exposure.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes

Brief Explanation

Protecting Iowa's water resources continues to be an issue that impacts all Iowans. Legislators and other elected officials debate the best strategies for addressing this issue and legislation has been enacted. Utilizing university research, extension programming focuses on helping farmers and certified manure applicators identify best management practices for reducing nutrient in the water supply and protecting groundwater sources through hands-on education.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Workshops conducted by an ISU Extension increased farmer knowledge on fertilizer application practices. The follow-up evaluations provided data to calculate an overall economic benefit for those farmers attending the workshops. Farmer attendance represented about 100,000 acres. With an average reduction of \$17 per acre in purchased fertilizer by implementing practices learned, the total economic benefit comes to about \$1.7 million. In addition to the direct financial benefit to the farmers, are the potential improvements in environmental stewardship. The program directly benefits the farmers' bottom line and helps achieve goals established for water quality programs such as the Iowa Nutrient Reduction Strategy.

Key Items of Evaluation

Continued education on field drainage systems will help educate farmers and service providers of the impact water-logged areas have on crop yield. When a drainage system is properly designed and installed, farmers can benefit from improved corn yields from 120 to 150 bushels per acre. During the history of The Iowa Drainage School, 51,722 acres have benefitted from the farmers' knowledge gained in the workshop. At a market price of \$3.00

per bushel for corn, \$1,551,660 of increased income has been realized.

Of those who attended the Iowa Beef Center forage management programs, 80% have made one or more changes to their grazing management, resulting in more than a 30% improvement in their forage productivity and more than \$500 improvement in their economic return. By making improvements in pasture productivity and integrating cover crops into row crop enterprises, Iowa beef producers are more profitable and their operations have greater sustainability. In addition to improvement in beef production, increasing forage production in the state of Iowa aids in building wildlife habitat, reducing soil erosion, and improving water quality for all Iowans.

V(A). Planned Program (Summary)**Program # 6****1. Name of the Planned Program**

Sustainable and Renewable Energy

 Reporting on this Program**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	8%		13%	
111	Conservation and Efficient Use of Water	8%		0%	
112	Watershed Protection and Management	0%		3%	
125	Agroforestry	8%		0%	
131	Alternative Uses of Land	8%		2%	
132	Weather and Climate	0%		5%	
136	Conservation of Biological Diversity	8%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		13%	
202	Plant Genetic Resources	0%		13%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		7%	
205	Plant Management Systems	5%		7%	
302	Nutrient Utilization in Animals	8%		1%	
402	Engineering Systems and Equipment	8%		13%	
403	Waste Disposal, Recycling, and Reuse	8%		0%	
404	Instrumentation and Control Systems	0%		1%	
511	New and Improved Non-Food Products and Processes	8%		5%	
601	Economics of Agricultural Production and Farm Management	8%		5%	
602	Business Management, Finance, and Taxation	8%		1%	
604	Marketing and Distribution Practices	0%		2%	
605	Natural Resource and Environmental Economics	7%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	2.6	0.0	4.2	0.0
Actual Paid	1.8	0.0	5.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
227409	0	1021041	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
227409	0	1021041	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
40519	0	4073154	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Iowa State University focused resources and efforts on developing improved crops and plant materials for use as feedstocks to produce biofuels and biobased products while still producing adequate food and feed supplies; developing agronomic practices to produce these feedstocks in sustainable ways to mitigate environmental risks; developing new harvesting, storing and transporting systems for these new feedstocks; and adopting new conversion processes that are more efficient, use less energy and water, and produce value-added co-products. The ISU BioCentury Research Farm played a key role. Extension programming focused on advising farmers interested in biomass production on the risks and benefits of crops as biofuels.

Faculty participated in relevant multistate research committees: NC0213, S1041, S1054, and W2006.

2. Brief description of the target audience

Stakeholders engaged with research and extension activities associated with this program include: crop producers and landowners, beginning and early career farmers, private citizens, state and federal agricultural and natural resource agencies, environmental groups, landowners, agricultural and natural resource scientists and engineers, agribusinesses, and policy makers. A targeted audience also includes developers of building construction materials, plastics, and adhesives; rural communities with new employment opportunities and economic development, and processing companies with advanced conversion technologies.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1011	3	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	28

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of people who attend an educational activity to learn about energy sustainability.

Year	Actual
2017	1004

Output #2

Output Measure

- Number of extension publications on this topic that were distributed as downloads and printed materials

Year	Actual
2017	38172

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of producers who increase their awareness of crop production strategies appropriate for bioenergy production.
2	Number of individuals who increase their knowledge in production/harvesting systems related to biomass crops.
3	Crop farmers in Iowa have increased knowledge of how bioenergy can provide both economic and environmental benefits

Outcome #1

1. Outcome Measures

Number of producers who increase their awareness of crop production strategies appropriate for bioenergy production.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of individuals who increase their knowledge in production/harvesting systems related to biomass crops.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	640

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Miscanthus × giganteus is a perennial biomass crop capable of producing more biomass per unit time and land area than any other adapted crop in the Midwest. The U.S. Department of Energy's 2016 Billion-Ton Assessment indicates that M. × giganteus could provide more cellulosic biomass than any other herbaceous crop analyzed. Further, perennial grasses like M. × giganteus hold soil, improve water quality, and provide other ecosystem services such as wildlife habitat. Using M. × giganteus for bioenergy in row-crop dominated agroecosystems like the Corn Belt could expand renewable energy production while protecting the natural resource base on which this region depends. This work will also diversify the Iowa farming landscape as well as farmer income portfolios. With falling grain prices, farmers are interested in a third crop, especially for subprime acres.

What has been done

Since 2009, Iowa State University has been conducting agronomic research on M. × giganteus. Early results motivated their partner, the University of Iowa, to adopt M. × giganteus as a new biomass fuel to cofire with the coal at the university's power plant. Iowa State Extension and its partners planted more than 800 acres of M. × giganteus to establish a collaborative field

experiment to test its economic and environmental sustainability, and identify best crop management practices. The Long-term Assessment of Miscanthus Productivity and Sustainability (LAMPS) project has been established at three sites to answer agronomic, environmental and economic questions associate with *M. x giganteus* use in temperate agroecosystems. In addition, a subfield analysis was conducted to show that placing a perennial grass on the parts of crop fields that were consistently unprofitable in the years 2012-2015 reduced N loss by 38%, nearly reaching Iowa's nutrient reduction goals. Project results have been disseminated through newsletters, emails, web pages, newspaper articles, Facebook and Twitter posts, field days, extension presentations and scientific meeting presentations.

Results

Farmers and an agribusiness have begun planting bioenergy grasses and working with Iowa State researchers to learn how to manage their crops. To assist in this education, a growth and development scale was produced to allow farmers to conduct management operations at developmental time for the crop instead of by a calendar date. More than 640 participated in Iowa State programming, 3,151 viewed online videos and 5,494 publications were downloaded from the ISU Extension Store. Using the field trial infrastructure established in 2017, LAMPS was used to make discoveries related to photosynthetic efficiency and aging of perennial grasses. This information will be used for agronomic and ecological understanding of forage, prairie, and cropland.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Crop farmers in Iowa have increased knowledge of how bioenergy can provide both economic and environmental benefits

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Miscanthus × giganteus is a promising biomass crop for Iowa, based on its high yields and low input requirements. However, several factors have limited farmer adoption, particularly lack of best management practices (BMPs) that would optimize yields and maintain ecological resources. The proposed work is the result of a critical need identified by the University of Iowa's Biomass Fuel Project (UI BFP). The UI BFP has developed a plan to help meet the UI's 2020 goal of 40% renewable energy by co-firing sustainably produced biomass with fossil fuels.

What has been done

To help crop farmers understand how bioenergy can provide both economic and environmental benefits in Iowa, we established a field trial and conducted an analysis showing that placing a perennial grass on only the parts of crop fields that were consistently unprofitable in the years 2012-2015 would reduce N loss from crop fields by 38%, nearly reaching Iowa's nutrient reduction goals while simultaneously saving farmers money. Project results were disseminated through newsletters, emails, web pages, newspaper articles, social media, field days, Extension presentations and scientific meetings.

Results

Overall, this work has had a major impact on biomass production in Iowa by removing knowledge limitations associated with crop choice and best management practices. As a result, farmers and an agribusiness have begun planting bioenergy grasses in Iowa and working with us to help manage them.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities

Brief Explanation

Activities of the Iowa State University biomass project has been focused on developing a research framework and collaborator network. This objective has been achieved and program staff are now building on its success. During the past year, the collaborator network has grown. Continued research and outreach with Iowa State University faculty, staff, and students, along with colleagues from the University of Iowa, and the M. × giganteus agribusiness, AGgrowTech will be the focus in the upcoming months.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

More than 640 participated in Iowa State University biomass education programming, 3,151 viewed online videos and 5,494 publications were downloaded from the ISU Extension Store. Using the field trial infrastructure established in 2017, Long-term Assessment of Miscanthus Productivity and Sustainability (LAMPS) plots were used to make discoveries related to photosynthetic efficiency and aging of perennial grasses. This information will be used for agronomic and ecological understanding of forage, prairie, and cropland.

Key Items of Evaluation

More than 640 participated in Iowa State University biomass education programming, 3,151 viewed online videos and 5,494 publications were downloaded from the ISU Extension Store. Using the field trial infrastructure established in 2017, Long-term Assessment of Miscanthus Productivity and Sustainability (LAMPS) plots were used to make discoveries related to photosynthetic efficiency and aging of perennial grasses. This information will be used for agronomic and ecological understanding of forage, prairie, and cropland.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Youth Development

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	9.7	0.0	0.0	0.0
Actual Paid	11.8	0.0	0.0	0.0
Actual Volunteer	191.7	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
985174	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
985174	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1970235	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- In the Arts, Iowa developed "4-H Camera Corps," a year-round, statewide educational opportunity to creatively explore photography and social media. Each month, selected youth photographers respond to a

photography topic/theme. Photographs are submitted digitally to Iowa 4-H social media platforms based on voting by the public and a panel of professional photographer evaluators. The top voted photographs from each assignment of the month will be highlighted and receive statewide recognition. The top photos from the year will be printed and shown at statewide gallery exhibitions.

- A new unit focusing on Professional Development was created. Based on a logic model and current topics in 4-H and Extension, training and education will be offered to state- and county-paid 4-H staff.
- To expand capacity in curriculum development and research-based education, Iowa 4-H invested in shared positions in strategic partnerships with ISU Colleges, including Design, Agriculture, Education, and Human Development and Family Studies.
- Iowa was selected as one of the first 10 states to pilot "Common Measures 2.0," with a grant from the Bechtel Foundation via the National 4-H Council.
- Iowa continues to invest in providing data to the state on the number of youth in K-12, race and ethnicity of youth, achievement gap indicators, and 4-H program participants. This data is packed into "Data for Decision Makers - 4-H." In 2017, DDM was expanded to include membership recruitment and retention, volunteer and staff ratios, and family income data sets.
- Iowa has fully implemented a blended-learning model for its 4-H volunteers. In addition to in-person new volunteer and annual volunteer training, Iowa has developed a series of videos on a variety of topics for volunteers, which they can view at the own convenience. They can track completion of the series in 4-H Online.
- Selected counties received grants from Iowa 4-H to engage underserved youth in traditional county 4-H fair activities to expose these youth to fairs as a showcase for 4-H projects and learning.
- 2017 saw the creation of regional "Culturally-based Youth Leadership Accelerators" program, based on the success of the Maize and Ujima statewide CYLAs. A regional CYLA was held in Northwest Iowa called Northwest Iowa GRiT (Getting Real Together). It is a partnership between ISUEO, 4-H, Human Sciences, and Northwestern College that seeks to reach out to and empower underrepresented youth through leadership and educational experiences. 81 youth attended from two Northwest Iowa counties for a daylong event held on Northwestern's campus, where youth participated in leadership activities, education experiences with college professors, and connected with youth like them, from other schools.

2. Brief description of the target audience

- ISUEO Youth Program Specialists
- County Extension youth staff
- 4-H volunteers
- ISU faculty
- Youth-serving organizational partners
- K-12 Iowa youth

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6964	61057	95569	17270

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Enrollments in 4-H Citizenship and Leadership curricula areas.

Year	Actual
2017	31045

Output #2

Output Measure

- Enrollments in 4-H Communications and Arts curricula areas.

Year	Actual
2017	26300

Output #3

Output Measure

- Enrollments in 4-H Foods, Nutrition, Physical Health, and Fitness curricula areas.

Year	Actual
------	--------

2017 74510

Output #4

Output Measure

- Enrollments in 4-H Science, Engineering, and Technology (SET) curricula areas.

Year	Actual
2017	127498

Output #5

Output Measure

- Number of 4-H livestock exhibitors certified in Food Safety and Quality Assurance (FSQA).
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of children and youth who participate in 4-H Afterschool.

Year	Actual
2017	32080

Output #7

Output Measure

- Number of 4-H partnerships initiated or strengthened.

Year	Actual
2017	5483

Output #8

Output Measure

- Number of volunteers completing one professional development training per year.

Year	Actual
2017	2835

Output #9

Output Measure

- Percentage of 4-H club members in their senior year of high school who will be attending a college/university/professional school/trade school/institute of higher education within 12 months of their high school graduation.

Year	Actual
2017	91

Output #10

Output Measure

- Number of children and youth who participate in the camping delivery mode.

Year	Actual
2017	5511

Output #11

Output Measure

- Number of youth reached by programming in health, physical fitness, and/or nutrition targeted towards impacting Childhood Obesity

Year	Actual
2017	23341

Output #12

Output Measure

- Number of children and youth (K-12) reached through one or more Project Food, Land & People lessons

Year	Actual
2017	1920

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Average percentage of youth who self-report improved healthy living practices after engaging in 4-H learning experiences.
2	Average percentage of youth in grades 4 - 6 who self-report improved food safety and quality assurance practices after engaging in 4-H learning experiences.
3	Average percentage of youth who self-report improved STEM processing practices after engaging in 4-H STEM learning experiences.
4	Average percentage of youth who self-report improved communication practices after engaging in 4-H learning experiences.
5	Average percentage of youth who self-report improved citizenship and leadership practices after engaging in 4-H learning experiences.
6	Average percentage of youth who self-report improved learning practices after engaging in 4-H educational experiences.
7	Average percent of youth who self-report improved citizenship practices after engaging in 4-H learning experiences.
8	Average percentage of youth who self-report improved leadership practices after engaging in 4-H learning experiences

Outcome #1

1. Outcome Measures

Average percentage of youth who self-report improved healthy living practices after engaging in 4-H learning experiences.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	33

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa now has the 13th highest adult obesity rate in the nation, according to The State of Obesity: Better Policies for a Healthier America, released August 2017. Iowa's adult obesity rate is currently 32 percent up from 20.9 percent in 2000 and from 12.2 percent in 1990. 29.9% of 10-17 year-olds are overweight or obese. However, there are signs of progress. Obesity declined among 2- to 4-year-olds enrolled in WIC from 2010 to 2014, dropping from 15.6% to 14.7%. Health professionals say to reduce the percentages of overweight or obese youth and adults, additional healthy living education, recreational opportunities, and access to nutritious foods is necessary for children, youth, and their families.

What has been done

Workshops focusing on cooking skills, nutrition, physical activity, emotional, and social wellbeing were integrated into statewide events in 2017 reaching 1,000 youth. Youth took part in gardening day camps and clubs, where they learned how to grow foods locally, and distribute them to benefit others through schools and food pantries. Pick a Better Snack lessons were given in K-3rd grade classrooms each month. Reaching more than 30 school districts and 9,961 youth. Iowa launched SWITCH, a school-based program for 4th-5th graders to switch what they Do, View and Chew, which was integrated with school wellness policy and curriculum to help youth make healthy choices in being active, decreasing their screen time, and eating more fruits and vegetables, now in 25 schools. 4-H partners with Iowa State University on SWITCH School Wellness Integration Targeting Child Health.

Results

A sample of 519 youth completed the Healthy Living self-assessment tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' healthy living behaviors and practices after participating in 4-H, as compared to before participating in 4-H. On average, 28%

of youth indicated a 1-point increase and 5% indicated a 2-point increase or more in their healthy living behaviors and practices after participating in 4-H. Youth indicated being involved in 4-H helped them strengthen their healthy living practices of 1) eating a variety of fruits and vegetables, 2) making healthy food/snack choices, 3) safely and carefully handling and preparing food, 4) participating in physically active events, and 5) helping their family make healthy food choices and meals. Reliability analysis indicated that the individual questions within the construct represented the conceptual meaning of the given construct. The respondents reported statistically significant 'After' scores than 'Before' scores.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Average percentage of youth in grades 4 - 6 who self-report improved food safety and quality assurance practices after engaging in 4-H learning experiences.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6763

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa produces more than \$13 billion in livestock sales across all commodities, and ranks #1 in both egg layer and hog production (Iowa Department of Ag Statistics, 2012). Over 15,000 Iowa 4-H'ers are enrolled in livestock projects. Providing a safe and healthy food supply has always been a key issue, but it has become even more important to consumers, wholesale distributors, restaurant chains, and foreign export markets.

What has been done

A comprehensive food safety and quality assurance curriculum program is conducted each year with Iowa 4-H'ers. Through the use of a variety of educational materials, including video tutorials and hands-on learning, youth learn about 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.

Results

Youth enrolled in Food Safety and Quality Assurance training were asked to complete a post-learning survey based on a 5-point Likert scale. Youth in grades 4-6 were administered a survey of nine questions regarding how their FSQA techniques and practices were changed in the areas of communication skills, Safe feeds/ Feed additives, and Biosecurity. 128 youth completed the survey. Survey results showed an average of 96.4% of youth indicated a 1- to 4-point increase in their communication techniques. An average of 91.5% indicated a 1- to 4-point increase in their safe feeding and feed additive practices, and an average of 85.6% youth indicated a 1- to 4-point increase in their biosecurity techniques. Youth indicated being involved in 4-H FSQA training strengthened their techniques and practices in the areas of safe feeding practices and proper biosecurity measures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Average percentage of youth who self-report improved STEM processing practices after engaging in 4-H STEM learning experiences.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to Pew Research Center, employment in science, technology, engineering and math (STEM) occupations has grown 79% since 1990, from 9.7 million to 17.3 million, outpacing overall U.S. job growth. STEM jobs are growing at 1.7 times the rate of non-STEM jobs, and the U.S. is simply not producing enough candidates to fill them. Only 16% of high school seniors are interested in pursuing STEM careers, according to the Department of Education.

What has been done

To encourage interest in STEM occupations, we provided workshops, school enrichment activities, STEM-themed camps, after school programs and clubs, and individual project work. We

used national 4-H curriculum, such National Youth Science Day Drone Discovery; ISU and other Land Grant University resources such as C6 BioFarm; the Governor's Advisory Council STEM Initiative; and NASA and NOAA science education resources. Iowa 4-H hosted the State Science and Technology Fair of Iowa where more than 700 youth presented their STEM research in a poster and interacted with professionals in their field.

Results

919 youth completed the STEM Self-Assessment Tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' STEM processing practices after participation in 4-H as compared to before. On average, 34.2% of youth indicated a 1-point increase, 5.6% indicated a 2-point increase, and .5% indicated a 3-point increase in their science processing practices after participating in 4-H. Youth indicated being involved in 4-H helped them strengthen their STEM processing skills in the areas of 1) asking questions that can be answered by scientific investigation; 2) designing an investigation to answer a question; 3) explaining to others how to do an investigation; 4) creating a graph, table, picture, or display to share information with others; 5) explaining why things happen in an investigation; 6) using evidence to defend their ideas. Youth indicated being involved in 4-H improved their attitudes towards STEM when asked 1) I like science; 2) I am good at science; 3) I choose to do science-related and engineering-related activities that are not assignments for school; 4) I think Science will be important in my future; 5) Science is useful for solving everyday problems; and 6) There are lots of ways science could be used to solve society's problems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Average percentage of youth who self-report improved communication practices after engaging in 4-H learning experiences.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	54

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to a 2014 Pew Research Center survey (American Trends Report), 90% of respondents said communication skills were the most important skill needed for children to succeed in life. "Are They Really Ready to Work? Employer's Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century Workforce" (2006) stated "the future workforce is here, and it is ill-prepared." Business leaders reported that "while the three "R's" are still fundamental to every employee's ability to do the job, applied skills such as team work, critical thinking, and communication are essential for success at work. In fact, at all education levels, these applied skills trump back knowledge skills such as reading and mathematics in importance in the view of employers."

What has been done

All 100 counties offer a communication event program. Nearly 2000 4-H members participated in public speaking and performance events at the 2017 Iowa State Fair. Competitive events, such as Robotics Challenge and Livestock Judging contests, include oral communication opportunities as part of the event. 4-H members competing for state-level project awards and trips have a personal interview as part of the selection process. Increasing communication skills and communication opportunities in 4-H clubs continued to be emphasized at leader trainings. All 4-H'ers are expected to demonstrate learning by giving a presentation or demonstration, typically at a club or group meeting. More than 20,000 4-H members demonstrated written, oral and visual communication skills as they prepared and presented fair exhibits.

Results

1049 youth, who participated in various 4-H delivery modes, completed the Iowa 4-H Communication constructs as part of a Self-Assessment Tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' communication practices after participating in 4-H compared to before participating in 4-H. On average, 37.6% of youth indicated a 1-point increase, 16.1% indicated a 2-point or more point increase in their communication practices after participating in 4-H. Youth commonly indicated being involved in 4-H helped a young person strengthen communication practices such as 1) feeling confident when speaking in front of others, 2) using good listening skills when others are talking, 3) feeling comfortable asking questions, 4) using technology to express interests, and 5) creating products to share ideas/information.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Average percentage of youth who self-report improved citizenship and leadership practices after engaging in 4-H learning experiences.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Average percentage of youth who self-report improved learning practices after engaging in 4-H educational experiences.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	53

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2008, Iowa passed a law requiring full implementation of the Iowa Core Education Standards by all public and accredited nonpublic schools. As Iowa worked to develop and implement the Iowa Core, a group of states joined to develop a set of common standards in English/language arts and mathematics. Called the Common Core State Standards, these elements were to involve three principles: 1. Standards had to be based on evidence of college and career readiness; 2. They had to focus on giving teachers time to teach and students to learn; and 3. They had to maintain local flexibility and allow for teacher judgment.

What has been done

In 2014, Iowa 4-H decided to formally link its curriculum to the Iowa Core. Over time, every program priority area and project area will be supported by curriculum that meets Iowa Core standards. This includes national 4-H curriculum as well as research-based, peer reviewed curriculum. Iowa continues to use an experiential learning model as the primary instructional method. Iowa 4-H is committed to demonstrating from data and evaluation how 4-H support college and career readiness, an environment for youth learning, and youth choice. Youth are asked to complete a self-assessment of their club experience, and project- or program-specific curriculum evaluations. All delivery modes provide youth the opportunity to enhance learning and demonstrate skills learned.

Results

1,005 youth participants in a variety of 4-H delivery modes completed the Iowa 4-H Learning Practices construct as part of a self-assessment tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' learning practices after participating in 4-H as compared to before. On average, 37.7% of youth indicated a 1-point increase, 19.1% indicated a 2-point or greater increase in their learning practices after participating in 4-H. Youth indicated being involved in 4-H helped a young person strengthen learning practices such as 1) creating

learning goals; 2) reviewing a variety of resources related to a topic; 3) identifying the strengths and weaknesses of different ideas, solutions, or approaches; 4) thinking about what is going well and what needs to change to achieve goals; and 5) applying what was learned to new experiences. Reliability analysis indicated that the individual questions within the Learning construct represented the conceptual meaning of the given construct. 'Before' indicators were also significantly correlated with 'After' indicators. Respondents reported statistically significant 'After' scores than 'Before' scores for the Learning Construct and all individual questions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Average percent of youth who self-report improved citizenship practices after engaging in 4-H learning experiences.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Citizenship - Campbell and Erbstein (2012) found youth's civic engagement can deepen their civic commitment, extend social capital, create meaningful relationships with adults, foster self-esteem and identity development, and build a sense of self and collective efficacy. Civic outcomes constitute a range of phenomena including students' knowledge of democratic processes and issues, organizing skills, commitments, and identities (Barnhardt, Sheets, & Pasquesi, 2015). Hennes, Ball, and Moncheski (2013) found both youth and adults benefit from a community youth development approach to service learning. In addition, both community recognition and community capacity increase. Individuals' involvement in the community positively impacts not just the participants, but also the larger community.

What has been done

4,309 youth enrolled in Citizenship; 1,069 youth and adults contributed 2,961 volunteer hours to improve their communities via the State 4-H Youth Conference and DuPont Pioneer Community Improvement grants. 19 4-H clubs leveraged \$6,265 in DuPont Pioneer grants into nearly

\$14,385 in community improvement projects. Five 4-H members served as delegates to the National 4-H Conference; 50 4-H'ers participated in the national Citizenship Washington Focus program. 18 members interviewed for state-level Citizenship project awards. Participation in a service activity is an expectation of all 4-H members and 4-H clubs.

Results

1176 youth enrolled in various 4-H delivery modes completed the Iowa 4-H Citizenship and Leadership constructs as a part of a Self-Assessment Tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' citizenship and leadership practices after participating in 4-H as compared to before participating in 4-H. Reliability analysis indicated the individual questions within each of the respective constructs of citizenship and leadership learning represented the conceptual meaning of the given construct. 'Before' constructs were significantly correlated with 'After' constructs. The respondents reported statistically significant 'After' scores than 'Before' scores for each construct and all individual questions.

On average, 41.1% of youth indicated a 1-point increase, and 18.4% indicated a 2-point or greater increase in their citizenship practices after participating in 4-H. Youth indicated 4-H helped with 1) making a difference in communities through service learning projects, 2) applying knowledge in ways that solve real-life problems through service learning projects, 3) working on service projects to meet needs in their communities, and 4) gaining skills that will help them in the future through service their communities, 5) listen to various viewpoints whether they agree or not, and 6) learning about people who are different from themselves.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

Average percentage of youth who self-report improved leadership practices after engaging in 4-H learning experiences

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	53

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Wagner and Mathison (2015) found that community-based learning has the potential to give students experiences that will challenge their ability to address their own assumptions about working with others, where knowledge lies, and how to engage in a leadership process. Learning collaborative leadership values and skills prepares students to engage in the community more sensitively and effectively (Wagner & Mathison, 2015; Astin & Astin, 2000). Additionally, research shows that youth who participate in developmentally appropriate decision-making activities and those who have access to meaningful youth development supports and opportunities are better prepared to make a successful transition to adulthood (Gambone, Klem, and Connell 2002).

What has been done

19,414 Iowa youth are enrolled in Leadership. More than 2,115 community and project clubs provide leadership experiences for members. 680 youth and 72 adults received leadership training during the Iowa 4-H Youth Conference; 48 youth and adults completed Youth-Adult Partnerships training; 20 4-H members represented Iowa at the National 4-H Congress. 40 high school members of the State 4-H Council plan the youth conference and serve as ambassadors. Approximately 120 youth had volunteer leadership positions with 4-H events during the 2017 Iowa State Fair.

Results

1176 youth enrolled in various 4-H delivery modes completed the Iowa 4-H Citizenship and Leadership constructs as a part of a Self-Assessment Tool. The tool, based on a 5-point Likert scale, examined self-reported changes in youths' citizenship and leadership practices after participating in 4-H as compared to before participating in 4-H. Reliability analysis indicated the individual questions within each of the respective constructs of citizenship and leadership learning represented the conceptual meaning of the given construct. 'Before' constructs were significantly correlated with 'After' constructs. The respondents reported statistically significant 'After' scores than 'Before' scores for each construct and all individual questions.

On average, 37.8% of youth indicated a 1-point increase, and 15% indicated a 2-point or greater increase in their leadership practices after participating in 4-H. Youth said involved in 4-H helped a young person strengthen leadership practices such as 1) working together in a team, 2) listening and talking to others before making decisions, 3) handling conflict respectfully, 4) lead a group in making decisions, 5) treat everyone fairly and equally when in charge of a group.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

- Competition for youth and financial support of families - county staff often point to competition for youths' time and family resources as reasons why 4-H membership does not change dramatically from year to year. The state program has responded by providing information on our cost, the cost of our competitors and our focus on positive youth development with research-based curricula and the experiential learning model.
- Competition for volunteer time - the state office continues to work on strategies to recruit volunteers of color to serve youth of color. The state office continues to invest in and expand the amount of online training available to make training as convenient as possible for volunteers.
- Competition for outside funding and partners - like other governmental entities, funding is always a concern, and competition for resources exists. Funding cuts to the Land Grant Institution came in 2016-17 and are expected in 2017-18 due to declining state revenues.
- Continued turnover at county Extension district level - Iowa continues to see about a 33 percent turnover annually in county youth staff. This causes delay and inconsistency in adoption of new curricula, programs to meet the needs of underserved youth, and new volunteer training material.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Iowa starts with a review of actions under its four program priority areas: STEM, Healthy Living, Citizenship and Leadership, and Communication and the Arts. Iowa also chose and adapted 35 4-H Outcome Indicators from the National 4-H common measures 1.0 indicators, corresponding to each program priority area. Data is collected on these selected indicators throughout the program year. In addition, there are indicators relating to the construct of learning. The data collected is also reflective of the delivery mode employed, which for Iowa includes afterschool programs, camps, clubs, events and school-based programs. ISU's Research Institute for Studies in Education (RISE) annually analyzes the data. Several analyses were conducted. Item frequencies were calculated for both now and before Likert-scale items and demographic items (such as gender and grade level). Constructs were calculated for areas of practice and the resulting constructs were tested to examine reliability. Additional statistical tests were used to examine differences between ratings before and after participation, as well as gain scores by grade level. A paired-samples t-test was conducted to compare the overall change participants experienced before and after participation in 4-H programs. A one-way analysis of variance (ANOVA) test was conducted to examine differences by grade level. A Scheffé post-hoc test was conducted to determine which pairs of means differed significantly after a significant F ratio was found with the ANOVA. Average percent of youth who self-reported change in each area of practice after a learning or educational experience was calculated from gain scores for constructs and items. Frequencies reported a negative change (< -.50), no change (-.49 - +.50), 1-point change (.51 - 1.50), 2-point change (1.51 - 2.50), 3-point change (2.51 - 3.50), or 4-point change (> 3.50). Changes of one point or more were considered as improved practice. Iowa 4-H uses logic models as program development road maps in the areas of planning, implementation, and evaluation. Logic models have been created for STEM, healthy living, citizenship, leadership, and communication and the arts constructs. Self-assessments with indicators corresponding to each construct were completed by youth. The self-assessment tool examined self-reported changes in youths' knowledge

and/or practices after participating in 4-H programming as compared to before 4-H programming. The self-assessment tool was based on a 5-point Likert scale (1 = "not at all" and 5 = "great deal." Reliability analysis of the Self-Assessment tool indicated the individual questions within the constructs represented the conceptual meaning of the given construct. "Before" indicators were also significantly correlated with "After" indicators. Further, statistical comparisons of "After" and "Before" responses (all respondents combined) using paired t-tests were conducted for each of the constructs, as well as for the individual questions within the constructs. The respondents reported statistically significant "After" scores than "Before" scores for all of the Learning Constructs and nearly all individual questions.

Key Items of Evaluation

FOOD SAFETY ... The Iowa 4-H Program uses logic models that act as program development road maps in the areas of planning, implementation, and evaluation. The results indicated in this section are based on animal science-identified logic model outcomes. In the 2015/2016 program year, youth from 33 randomly selected counties enrolled in the Food Safety and Quality Assurance training were asked to complete a post-learning survey based on a 5-point Likert scale. Youth in grades 4-6 were administered a survey of nine questions regarding how their FSQA techniques and practices were changed in the areas of communication skills, Safe feeds/ Feed additives, and Biosecurity. 422 youth completed the survey. Survey results showed an average of 94.6% of youth indicated a 1- to 4-point increase in their communication techniques. An average of 92.7% indicated a 1- to 4-point increase in their safe feeding and feed additive practices, and an average of 92.8% youth indicated a 1- to 4-point increase in their biosecurity techniques. Youth indicated being involved in 4-H FSQA training strengthened their techniques and practices in the areas of feeling confident when sharing information with others; safe feeding practices; proper biosecurity measures.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes with climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.