

2016 Iowa State University Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 06/02/2017

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.

Iowa's abundance is astonishing, ranking second nationally (behind California) with cash farm receipts (2015) of \$29.5 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 (2015). Iowa had 3,134,693 residents in 2016, 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 (2010). Urban areas contain 64 percent of Iowa's residents and about two percent of the state's total land area (2010).

The Hispanic/Latino population, which includes people of any race, is the largest minority group in Iowa, accounting for 5.7 percent of the population in 2015. The Black or African American population, both Latino and non-Latino, is the second-largest minority group with 3.5 percent of residents. The Asian race group is third with 2.3 percent (2015). Iowa's non-Latino white alone population accounts for 86.7 percent of the total population (2015). The poverty rate for individuals in Iowa was 12.2 percent (+/- 0.4%) in 2015, compared to a rate of 14.7 percent (+/- 0.1%) for the United States. Minority students comprised 22.5 percent of preK-12 public school enrollment in 2015-2016, 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 2016 continues to incorporate the five USDA priority areas into our seven current programs. Climate change work is included in Food Security; childhood obesity work has been incorporated into Health and Well-being; food safety work is split, with consumer education falling under Health and Well-being, while production-related programming has been folded into Food Security. 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
- 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: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	384.0	0.0	494.2	0.0
Actual	359.0	0.0	156.1	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. 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 groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

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.
 - 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.

In addition, in summer 2015, the Iowa Association of County Extension Councils, Iowa State University Extension and Outreach County Services, and Iowa 4-H Youth Development Program convened the County 4-H Staff Taskforce to clarify and develop a set of guidelines to clarify roles and responsibilities. For more than 8 months, the taskforce collected input from two statewide surveys (more than 300 stakeholder respondents each), as well as 5 focus groups in communities across Iowa.

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
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

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 2016.

- Formal advisory boards, by far the most common method employed, specifically invite representation from the organizations and agencies that work in a given area, and may also include producers nominated by extension program specialists, and representatives of the program specialists, campus specialists and campus researchers.
 - Web-based needs assessment and listening sessions are 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.
 - 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 acquired a very good knowledge, increased 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 to districts 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
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey 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.
 - 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.

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; increased programming on cover crops and edge-of-field practices.
- Farm Financial Task Force met quarterly to provide objective analysis of farmers' options and programming on cost control and financial management.
- Expanded number of beginning and young farmer peer groups.
- Partnered with veterans in agriculture to train and certify farm succession facilitators.
- Increased programming on employer best practices, human resource management.
- State-wide local foods work group met quarterly; small farms Facebook established; small farms conference held.
- Developing modules for non-ag audiences about agriculture, food and water issues.
- Expanded Digital Agriculture program for farmers.

Human Sciences Extension:

- Hired people of diverse backgrounds for The Buy, Eat, Live Healthy program supervisor position in southeast Iowa and the Human Sciences Specialist, Family Finance position in Northeast

Iowa.

- The Adventure Comes to You partnership is with the Department of Food Science and Human Nutrition. Faculty visited five sites in Iowa, shared their research, and answered questions.
- Added the following program offerings: 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: addresses healthy food access for families experiencing poverty.

Community and Economic Development:

- Created a coordinator position in collaboration with the Refugee Alliance of Central Iowa to provide support to refugee families.
- Provided business assistance in diverse (incl. Latino) retail areas.
- Provided Retail-Scapes studio classes for minority-owned businesses.
- Specialists fluent in Spanish supported Latino business owners in business planning and facilitated "Juntos for a Better Education" programs.
- Continued to add data to Indicators Portal, a one-stop information site for local and regional community decision makers.
- Partnered with Community Food Systems program to promote local food systems.
- Conducted Stronger Economies Today program in collaboration with USDA Rural Development in Iowa, Missouri, and Illinois.
- Trained local elected officials and government and nonprofit employees through various programs on issues such as budgets, planning and zoning, and nonprofit management.
- Teamed with the City of Dubuque to address business and residential engagement in a revitalization project.
- Partnered with Center on Sustainable Communities to create the Community Sustainability Collaborative.
- Participated in Navigating Difference© cultural competency training and conducted training for other staff.
- Developed a tourism workshop and trained business owners and entrepreneurs.

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

Other often mentioned topics include:

- Human resource management
- Local foods and small farm and acreage living
- Ag literacy for non-farming public and youth
- Technology use and analysis "Big Data"

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 (examples provided):

- Family life (examples: relationships, communication, parenting, time and stress management, mental health/disability, pregnancy prevention, bullying, youth development)
 - Financial stability (examples: money management, cost of living, estate planning, investments, internet scams)
 - Child Care (examples: cost, quality, access)
 - Health and Health Care Coverage (examples: environmental issues, nutrition, obesity, physical exercise, outdoor education and recreation, healthy children, food safety, insecurity, and systems)
 - Growing older (examples: intergenerational issues, health, retirement, caregiving, death)
 - Community capacity (examples: leadership development, visioning, collaboration, knowledgeable local government, and access to education (literacy), housing, jobs, social networks, and resources)

Top issues related to the Community and Economic Development program include:

- Job creation and retention
- Individual and family sustainability
- Capacity building in communities
- Community development support to underserved populations
- Economic development support to underserved populations

Youth: Serving over 100,000 Iowa youth, Iowa 4-H by nature is complex and sometimes confusing to our partners. Furthermore, Iowa 4-H's greatest strength, the "passion" its stakeholders feel for the program, can also be its greatest liability. 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.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9642552	0	7663101	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	9126138	0	8888735	0
Actual Matching	9126138	0	8888735	0
Actual All Other	18920352	0	63639346	0
Total Actual Expended	37172628	0	81416816	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	9126138	0	7524400	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
608	Community Resource Planning and Development	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	2.5	0.0
Actual Paid	9.1	0.0	1.8	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
940091	0	273682	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
940091	0	273682	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1706521	0	574219	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.
- Continued to increase the data services available on the ISU Extension and Outreach Indicators data portal created in 2014 through which city and county governments are able to access a wide range of products using local finance, economic, and demographic data, all available from one website.
- CED Extension partnered with Center on Sustainable Communities (COSC) to create the Sustainability Collaborative to provide resources and outreach on best practices in construction, planning, and healthy living.
- Six CED specialists participated in Navigating Difference© cultural competency training and conducted training for other Extension and Outreach staff throughout the state.
- A team of ISUEO CED Program Specialists developed a three-hour tourism workshop on "How to Attract and Retain Travelers" and trained business owners and entrepreneurs throughout the state.
- Created a Refugee Community Plan Coordinator position in partnership with the Refugee Alliance of Central Iowa to provide support to refugee families settling in central Iowa.
- Conducted research to gain insights into factors that contribute to the functioning of agricultural and rural financial markets.

Faculty participated in relevant multi-state research committees NC1030 and NC1034.

2. Brief description of the target audience

Underserved Iowa populations (Latinos, African Americans and refugees) and the organizations that serve them; public officials; community leaders.

3. How was eXtension used?

CED specialist and associate professor Deb Tootle taught one module of Understanding Communities and Their Dynamics to 60 extension specialists nationwide via eXtension as part of the Foundations of Practice in Community Development program.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	63823	147803	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	18

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of articles, publications, reports, plans.

Year	Actual
2016	1235

Output #2

Output Measure

- Number of communities receiving planning and design assistance.

Year	Actual
2016	702

Output #3

Output Measure

- Number of jobs created/retained.

Year	Actual
2016	352

Output #4

Output Measure

- Number of people in underserved populations assisted.
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Businesses started or improved.

Year	Actual
2016	117

Output #6

Output Measure

- Community leaders and government officials trained.

Year	Actual
2016	3071

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	Increase 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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	702

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. The Office of State and Local Government Programs provided training to representatives from 582 communities through 2016 Municipal Professionals Institute/Academy, budget workshops, the Municipal Leadership Academy, On The Road workshops, and annual fiscal report workshops.

What has been done

The Iowa Living Roadway (ILR) Community Visioning program helped small towns develop design plans reflecting the values and identity of the community. The Partnering Learning and Community Engagement (PLACE) program partnered Iowa State University design classes with towns and organizations needing design and planning assistance. The Community Design Lab (CDL) assisted towns with design challenges at multiple scales. CD-DIAL (Community Development--Data Information and Analysis Laboratory) conducted surveys for communities as part of their long-term planning activities. Extension CED trained local governments, councils of governments, and nonprofits. CED specialists developed a tourism workshop to help Iowa communities reinvent themselves as tourist destinations. CED Extension partnered with Center on Sustainable Communities (COSC) to provide resources and outreach on best practices in construction, planning, and healthy living. The Office of State and Local Government Programs provided training to community representatives through the 2016 Municipal Professionals Institute/Academy, budget workshops, the Municipal Leadership Academy, On The Road

workshops, and annual fiscal report workshops.

Results

Seven hundred and two communities received planning and design assistance through our Extension and Outreach Community and Economic Development programs and specialists.

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
2016	352

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, Des

Moines County Extension, the University of Nebraska, West Liberty (WE-LEAD), and Cedar County (CCEDCO), and the regional development organization of southwest Iowa (SWICO). A team of ISU Extension and Outreach CED Program Specialists developed a three-hour tourism workshop on "How to Attract and Retain Travelers" and trained business owners and entrepreneurs throughout the state.

CED specialists trained 1,427 business leaders/entrepreneurs. PLACE and IRI assisted more than 15 business owners with branding/community identity. More than 260 business owners, entrepreneurs, and local leaders from throughout the state attended tourism workshops presented by CED specialists.

Results

In 2016, 352 jobs were created or retained within the businesses with which CED specialists worked. One hundred and seventeen businesses were started or assisted with help from Extension CED. Of those, 28 were minority entrepreneurs. Of the businesses CED specialists worked with, 87 businesses were expanded or improved.

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
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	591

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the 2010 US Census, 5% of Iowa's population is Latino, almost double that of the 2000 Census. Over the last 5 years, more than 3,000 refugees have arrived in Iowa, hailing from Burma, Bhutan, the Democratic Republic of the Congo, Eritrea, Iraq, and Somalia. The influx of immigrants to the state, particularly to Iowa's rural communities, creates the need for support to

new lowans who do not understand the U.S. tax system, health-care system, and other aspects of U.S. residency, as well as the need for long-time residents to adapt to their communities' changing demographics. All other minority groups, including people who identify two or more races, have grown significantly as well. As Iowa becomes more diverse, the need for business and community development assistance to underserved populations grows.

What has been done

ISU Extension CED continues to aggressively employing outreach strategies for this growing demographic. One-third of CED Extension field staff is fluent in Spanish. 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. Created a Refugee Community Plan Coordinator position in partnership with the Refugee Alliance of Central Iowa to provide support to refugee families settling in central Iowa.

Results

CED specialists provided JUNTOS training for 40 Latinos; citizenship training for 12 minorities; leadership training to 239 minorities; and education, outreach and/or facilitation to 152 minorities. CED specialists assisted 33 entrepreneurs from underserved populations in starting or expanding their businesses. Partnering Learning and Community Engagement (PLACE) and Iowa Retail Initiative (IRI) assisted 15 Latino business owners with branding/community identity. 64 minority women attended a Womyn of Color retreat facilitated by CED specialists. 36 Hispanic adults and youth participated in focus groups as part of the Community Visioning program in Hampton, Iowa.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Increase 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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The modern agricultural production system is critically dependent upon the financial management of agricultural operations. Producers need cost-effective access to capital and sound government policy in order to continue to meet the food, fiber, and bio-energy demands of the United States. The work of this Iowa project is focused on gaining insights that can contribute to the creation or improvement of programs and policies that bring about strong financial development in rural areas and improve the functioning of agricultural and rural financial markets.

What has been done

We conducted an analysis and published a study on the impact of different types of intellectual property protection on social welfare, explicitly modeling the effect that they have on the investments in research and development that agribusiness firms need to incur to develop and release new plant varieties. The alternative types of intellectual property protection that we examined were plant variety protection, utility patents, and voluntary licensing under patents. We found that plant variety protection and utility patents played important and complementary roles in promoting and adopting innovation. Voluntary licensing under patents had a major contribution to social welfare. Periods of protection longer than the current life span of a utility patent did not contribute maximally to the stock of social welfare. We performed a reality check comparing different types of innovation and assessment of time and risk to commercialization. We also analyzed the effect that different lengths of intellectual property protection have on agribusiness firms' incentives to invest in research and development.

Results

The study increased understanding of the impacts of different types of intellectual property protection on social welfare. This information is important because substantial investments in research and development are required before a new plant variety can be developed and released, costs of which the private sector can only recoup through commercial sales coupled with property rights.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The economy is a major external factor affecting ISU Extension CED outcomes. Not only has it led to a shrinking state budget, but more communities need assistance with budgeting and financial management, and some local businesses are struggling. That said, the economic climate is good for entrepreneurship.

Natural disasters that occurred as far back as 2008 continue to affect Extension CED outcomes. Communities such as Cedar Rapids are still recovering from the 2008 flood, east central Iowa is still rebuilding after flat-line winds, and more than half of the trees in Mapleton were destroyed by a tornado in 2011. CED specialists have been working with these communities on issues such as affordable housing, land use practices, population shifts, and other disaster-related issues.

The immigrant population of Iowa continues to grow and CED has responded with diversity training, assistance for immigrant entrepreneurs, and providing training on parenting skills, budgeting, and language.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

- These community projects involved random sample surveys in such topic areas as health care, health systems, economic development, land use, transportation, and environment and conservation.
- For the Community Visioning Program, focus groups were conducted in 10 communities to obtain feedback from specific demographics for the development of transportation enhancement concepts.
- Extension sociology continued the annual Iowa Farm and Rural Life Poll to understand how the ongoing changes in Iowa's agriculture and rural areas affect farmers and rural society as a whole.
- CED faculty member Deb Tootle was part of the SIGMA rural community study conducted by the ISU Sociology Department.

Key Items of Evaluation

Need for better community programming. 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 and the website and social media strategies, and continues to develop ongoing programming into products. The College of Design's Community Design Lab helps communities think through design challenges at multiple scales, many of which are part of disaster recovery (e.g., 2008 Cedar Rapids flood). Providing support for disaster recovery is crucial with the increasing number of severe weather events in Iowa. Several CED initiatives addressed healthy communities (the Sustainability Collaborative, Community Visioning, CDL). CED continues to develop programming for the growing Latino and refugee population in Iowa, including the creation of Refugee Community Plan Programmer with the Refugee Alliance of Central 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
607	Consumer Economics	0%		12%	
801	Individual and Family Resource Management	30%		36%	
802	Human Development and Family Well-Being	70%		30%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		22%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.2	0.0	3.9	0.0
Actual Paid	13.3	0.0	2.1	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
1252783	0	287839	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1252783	0	287839	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1877038	0	532767	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Researchers conducted extensive data analysis on factors that contribute to or create barriers to the physical and mental health of diverse, rural, low-income families. Findings were disseminated to family-serving professionals.

Additionally, 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 to strengthen their knowledge and skills regarding family finance management, parenting, and other family issues. We developed products, curriculum, on-line tools, and other educational resources for use in training, technical assistance, and facilitation of community-based processes.

Faculty participated in relevant multi-state research committees NC0170, NC1034, NC1171, NC1198, NC2172, and W2192.

2. Brief description of the target audience

Parents of children, teens, and 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 at <http://www.extension.iastate.edu/humansciences/ptc-tools>.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40334	39900	793	3278

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	20

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
2016	8269

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
2016	6005

Output #3

Output Measure

- Number of individuals participating in family finance educational programs.

Year	Actual
2016	6514

Output #4

Output Measure

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

Year	Actual
2016	120

Output #5

Output Measure

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

Year	Actual
2016	314

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	Number of family-serving professionals receiving 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.

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
2016	86

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 reduces risky behaviors for youth such as substance abuse and early sexual activity. 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 the form of 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. Youth who do not complete high school cost Iowa nearly \$90 million in reduced state tax revenues over their lifetime, and close to \$2 million per year in additional welfare costs. They will face higher unemployment, have increased health issues and are 10 times more likely to be incarcerated.

What has been done

A total of 1,291 parents/caregivers participated in a series of parenting education workshops. An additional 138 parents received parenting education and information through individual consultations. A total of 3,377 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. 184 community volunteers have partnered with Extension and Outreach to implement Juntos Para Una Mejor Educación (Together for a Better Education) with 174 Latino youth and 187 Latino parents in communities across Iowa.

Results

The large majority of parents (86%; N=992) who completed surveys after their participation in a parenting education program series reported improving their parenting skills. Additionally, 1,010 parents reported increased awareness of positive parenting strategies and 328 parents reported increased awareness of how to promote literacy among their children. The majority of parents

(88%; N=299) improved their parenting skills after participating in SFP 10-14/Familias Fuertes over a seven week period. Pre/post survey data from the Juntos program reveals that parents and youth significantly increased communication with each other about youth's goals for their future (N=122; p = .003) as a result of Juntos. Parents reported that they were more confident about helping their youth graduate from high school and pursue higher education (N=144; p=.000). Youth reported increased communication with teachers about their progress in school (N=169; p=.000).

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
2016	372

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 372 professionals were trained by ISUEO staff in evidence-based (Family Story Teller, Powerful Tools for Caregivers) and research-based (Juntos Para Una Mejor Educación; Together We Can) curricula to deliver family life education directly to families.

Results

Extension and Outreach staff, other trained professionals who work with families, and trained volunteers have implemented family life education programs to 8,269 individuals.

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
2016	94

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. The average annual income for a child care worker is \$18,930. Workforce turnover is reported at 26-40% 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 Early Childhood Environment Rating Scale (ERS) program provided child care professionals with a self-assessment, instruction, and an improvement plan to strengthen program quality. Formal, Environment Rating Scale Assessments were provided for 138 child care classrooms. The Better Kid Care New Staff Orientation program provided 16 hours of instruction for child care center staff and six hours of online instruction for child care center directors. Early Childhood Consultants working for Child Care Resource and Referral and Department of Public Health participated in an 18-hour skill-based introductory program and/or a four-day consultant credential and mentor credential program. Over 50 single topic child care provider workshops on health and safety and early learning were conducted across the state. Website resources, FCCERS Pinterest

and the Let's Talk Child Care Blog support training efforts.

Results

A total of 5308 early childhood professionals participated in ISUEO child care training and reported individual and program improvements. Nine hundred and seventeen child care or preschool teachers and 72 directors participated in the NSO program, completing 15,059 training hours. Preschool teachers completed workbook portfolios and showed statistically significant (p<.001) gains in each of the 11 NSO outcomes leading to improved child care quality and practice. Four hundred and seventy five Environment Rating Scale training participants completed self-assessments and began program improvement plans. A retrospective survey of child care professionals (n=475) participating in the Early Childhood Environment Rating Scale training 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 138 child care classrooms. In the I-Consult program, 36 early childhood education consultants learned and demonstrated skills in coaching and consultation, 11 consultants earned an I-Consult credential. An additional 3659 early childhood professionals participated in child care community and online workshops. Of the surveyed participants (n=2487), 92% reported improving learning environments and/or demonstrated teaching improvements.

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Eighteen percent of the U.S. population provided unpaid care to an adult or a child in the prior 12 months (National Alliance for Caregiving and AARP). These 43.5 million family caregivers help care for an adult with chronic conditions. They provide a vast array of services (e.g., emotional, financial, nursing, homemaking) on a daily or intermittent basis. The impact on caregivers is threefold: physical, emotional, and financial. One in five caregivers indicates their health is fair or poor and one in four says their health has declined from caregiving. One in five reports 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

Twenty-three 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 100+ class leaders prepared to deliver the program throughout Iowa. 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

One hundred and seventy-three family caregivers participated in Powerful Tools for Caregivers series and 100% of the caregivers who completed the evaluation survey (161 of 173) reported increased self-care practices (increased exercise, use of relaxation techniques, health self-care) after participation. They also increased self-confidence in their caregiver roles and improved management of emotions. The participants indicated an increased knowledge of resources and how to access them.

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
2016	70

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa lags behind in the nation in median household income and 16% of Iowa's children live in poverty (American Community Survey, 2015). The poverty rate has trended upward in Iowa over the last decade. Empirical research documents consumers' limited knowledge and skills to manage finance effectively. Financial management skills help families set priorities, develop plans for use of limited resources, reduce stress, and maximize satisfaction. Skills in accessing, evaluating and using reliable, unbiased and noncommercial information facilitate making informed decisions in an increasingly complex marketplace. Consumers who are knowledgeable and skilled decision-makers are more likely to make wise financial decisions, use appropriate financial products and services, and build financial security.

What has been done

Financial management skill-building programs were attended by 6,514 adults. Timely finance information reached 6,501 indirectly. Research-based programs targeted low- and moderate-income families to improve basic budgeting, credit management and banking skills. Workshops addressed financial challenges unique to women. Smart investing@your library, a hybrid program, strengthened savings and investing skills in partnership with rural public libraries. Smart Choice sessions promoted health insurance literacy. Online courses targeted young families learning to take control of finances and first-time homebuyers. Pilot programs addressed financial coaching, finances of caregiving, and retirement planning. Publications, news releases, a blog and webinars reached consumers with research-based information.

Results

At the conclusion of at least two sequential workshops, 72% (109 of 151) of participants surveyed reported improved money management skills. This average includes 72% of participants in Your Money, Your Future basic budgeting classes who reported improved skills in recordkeeping, planning, evaluation and assessment or access to reliable information; 73% of participants in Money Talk who reported improved management skills; and using matched pre- and post-surveys, 74% of Smart Investing learners scored higher on an objective knowledge test and improved abilities to assess adequacy of savings, risk tolerance, retirement needs and the quality of information sources.

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
2016	64

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 their goals. Research shows 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 6,514 adults. In addition, 6,501 adults 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, credit management, or retirement). Basic money management workshops emphasized setting realistic, achievable goals. Money Talk workshops, a five-week series, addressed financial planning, credit, insurance and investing. Smart Investing participants took hybrid classes, meeting face-to-face at the beginning and the conclusion of a four-part online course.

Results

On average, 64% (96 of 151) of surveyed participants in sequenced, in-depth workshops reported behavior change--making progress toward specific financial goals. 62% of participants in basic money management workshops reported making progress in achieving budgeting goals, managing credit or using banking services effectively. Among Money Talk participants, 91% reported progress on goals related to savings, reduction of debt, improving retirement preparedness, or estate planning. Using pre- and post-surveys, 58% of Smart Investing learners reported taking specific financial management actions, including assessing their risk tolerance,

estimating retirement needs, and using financial education resources at the public library.

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
2016	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research evidence supports 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 ill-prepared to help. Those who teach K-12 students lack confidence and skills to teach financial literacy, a subject now required in the Iowa core curriculum. Iowa has a shortage of Volunteer Income Tax Assistance (VITA) sites--particularly in rural areas.

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. Ninety-six teachers ordering HSFPP materials to use in teaching 3,278 high school students. Extension trained 52 VITA volunteers who completed 1,555 tax returns at no cost to the tax filers. Extension educators taught 86 agency staff located in Iowa communities to use the Consumer Financial Protection Bureau's "Your Money, Your Goals" toolkit. Following 8-plus hours of training, local agency staff were better prepared to assist their clients make financial management decisions.

Results

All VITA volunteers successfully completed IRS certification examinations and prepared 1,555 tax returns which resulted in \$841,392 in EITC refunds. VITA helps many low- and moderate-income Iowans avoid tax preparation fees and secure sizable refunds that circulate in the local economy and bolster family financial security. Using pre- and post-surveys, 82% (51 of 82) of the surveyed professionals and community leaders attending Your Money, Your Goals financial coaching training sessions reported increased understanding of how to access and use tools and materials from the Consumer Financial Protection Bureau through its consumer website.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #8

1. Outcome Measures

Number of family-serving professionals receiving 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.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	300

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

Researchers conducted extensive higher order analyses of previously collected, quantitative and qualitative interview data, to explore factors that create barriers or enhance the physical and mental health of diverse rural low-income families. Disseminated findings, based on the proposed analyses, in order to further the empirical knowledge base and increase understanding among

family serving professionals and policy makers regarding factors that contribute to or create barriers to the physical and mental health of diverse rural low-income families.

Results

As a result of this project, there is increased understanding among faculty, graduate students, extension staff and other family-serving professionals and the public of the multiple barriers and enablers to mental and physical health that rural low income families experience. Specifically, this study has led to increased awareness of the role of family, community, and public policies on the health and well-being of rural families. The focus of the project and the results to date have led to a private donor contributing \$8,000 to expand the project to help prepare graduate students involved with the project, as well as continue data collection with families. Six graduate students have strengthened their analytic skills and ability to communicate study findings to professionals and other researchers via publications, presentations, and a webinar as a result of this project. Rural low-income women have gained knowledge, skills and experience in conducting research with families, and have contributed to accurately understanding the implications of the findings. Findings from this study have been disseminated to over 300 family-serving professionals, including Extension and Outreach staff, faculty and undergraduate and graduate students in Iowa, as well as in other states.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Local organizations have tight budgets, limiting opportunities to participate in trainings and implement programs offered by ISU Extension and Outreach.

Few extension staff are proficient in Spanish which has limited offering education to Spanish-speaking individuals. However, Extension and Outreach has developed relationships with organizations that have Spanish-speaking staff to assist in program delivery.

Regional program responsibilities constrain staff in developing strong on-going partnerships with local organizations in all communities they serve.

A continued period of slow economic growth constrains lowans' incomes and their abilities to achieve financial goals. Declines in commodity prices have had negative impacts on the overall state economy.

Three field staff vacancies were filled: a multi-lingual program specialist is expanding our abilities to reach new lowans in one metro area; two experienced Extension and Outreach staff members working in rural areas have shifted responsibilities to focus on family finance.

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 causes of change, or pursue efforts to increase response rates; and lack of resources to conduct follow-up evaluations that yield high-response rates limits our ability to assess the 'staying power' of program effects.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

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=122; $p = .003$) as a result of Juntos. Parents reported that they were more confident about helping their youth graduate from high school and pursue higher education (N=144; $p=.000$). Youth reported increased communication with teachers about their progress in school (N=169; $p= .000$). Focus group data from youth (N=18) and parents (N=20) revealed that the Juntos program is filling a void in their communities. Additionally, youth and parents have learned more about each other and feel closer to each other as a result of Juntos.

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

- * 70% of participants survey during the last session of sequential financial management workshops reported improved financial practices.
- * 64% of participants survey during the last session of sequential financial management workshops reported making progress toward financial goals.
- * 82% of professionals and volunteers completing pre- and post-surveys during a sequential workshop increased their perceived knowledge and skills to teach financial management to their clients.
- * Extension-sponsored rural VITA sites helped eligible lowans access \$841,392 in refunded Earned Income Tax Credits.

Key Items of Evaluation

The Juntos Para Una Mejor Educación (Together for a Better Education) program has helped more than 300 Latino youth and their parents increase communication with each other about youth's aspirations for their future, feel closer as a family, feel more confident in communicating with school staff, and identify specific steps families need to take to help youth graduate from high school and pursue higher education.

Two in three surveyed participants in selected sequential financial management educational program improved their financial practices and made progress toward personal financial goals.

Volunteers for Extension and Outreach-sponsored rural Volunteer Income Tax Assistance (VITA) programs helped low income lowans access \$841,392 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%		2%	
131	Alternative Uses of Land	4%		1%	
132	Weather and Climate	4%		1%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		7%	
202	Plant Genetic Resources	0%		7%	
205	Plant Management Systems	11%		6%	
212	Pathogens and Nematodes Affecting Plants	2%		25%	
216	Integrated Pest Management Systems	9%		1%	
301	Reproductive Performance of Animals	4%		4%	
302	Nutrient Utilization in Animals	4%		26%	
303	Genetic Improvement of Animals	4%		6%	
305	Animal Physiological Processes	0%		5%	
311	Animal Diseases	0%		1%	
401	Structures, Facilities, and General Purpose Farm Supplies	7%		1%	
405	Drainage and Irrigation Systems and Facilities	4%		1%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		1%	
601	Economics of Agricultural Production and Farm Management	8%		1%	
602	Business Management, Finance, and Taxation	7%		1%	
603	Market Economics	8%		1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	4%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	23.6	0.0	41.2	0.0
Actual Paid	23.5	0.0	28.6	0.0
Actual Volunteer	29.0	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
2921874	0	5245023	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2921874	0	5245023	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
10438201	0	46945400	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Continued to be a leading research institution on basic and applied questions impacting Iowa's ability to increase agricultural production capacity.
- Maintained and strengthened 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 for production and the environment.
 - Hired and retained faculty and staff who are committed to the success of Iowa agriculture.
 - Fostered integrated research/extension teams to address priorities facing Iowa farmers and assist with risk management when making decisions for their operations.
 - Supported professional development of faculty and staff to ensure they are competitive in external funding, respected by peers and producers and proud and productive colleagues.
 - Educated producers and the public regarding the interaction between farming practices and water quality.
 - Conducted research and assisted farmers and landowners in adapting to the impacts of extreme weather fluctuations, such as drought, high temperatures, and excessive and unseasonable rainfall, on crop and livestock production.

Faculty participated in relevant multi-state research committees NC0140, NC0213, NC0246, NC1023, NC1029, NC1034, NC1170, NC1173, NC1177, NC1182, NC1183, NC1184, NC1194, NC1195, NC1197, NC1198, NC1200, NC1201, NC2040, NE1020, NE1048, NE1227, NE1334, NE1442, NRSP7, NRSP8, 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.
- Policy makers who impact agriculture.
- Existing and beginning farmers who are interested in producing and adding value to crops and livestock and in marketing them in such a way as to retain a larger share of consumer expenditures.
- 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.

As programming is developed, information will be targeted at farmers and landowners working to reduce the loss of nutrients to surface water using science-based strategies, and crop and livestock farmers. A focus will be on producers who can utilize research and education to make a difference, and who can benefit from and will apply research-based information. Audiences will include growers utilizing production systems that are affected by extreme weather, such as the 2012 drought and the excessively wet conditions in 2013 and 2014, and those who consult or influence their decisions.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	160625	6369852	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 4

Patents listed

Glycine Max Resistance Gene(s) and Use Thereof to Engineer Plants with Broad-Spectrum Resistance to Fungal Pathogens and Pests. Bhattacharyya et. al. Filed 1/6/16.

Artificial Intelligence for Detecting and Filling Void Areas of Agricultural Commodity Containers. Darr et al. Patent #9,392,746 issued 7/19/2016.

Materials and Methods for Using an Acyl-acyl Carrier Protein Thioesterase and Mutants and Chimeras Thereof in Fatty Acid Synthesis. Nikolau et. al. Patent #9,399,768 issued 7/26/16. Also applies to the Sustainable and Renewable Energy program.

Methods and Compositions Comprising Steroid Honey Bee Feeding Inhibitors. Jurenka et. al. Filed 10/27/16.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	604

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
2016	117292

Output #2

Output Measure

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

Year	Actual
2016	84287

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
2016	24417

Output #5

Output Measure

- Number of local food producers attending extension programs.

Year	Actual
2016	5434

Output #6

Output Measure

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

Year	Actual
2016	1223

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 food safety project websites.
Not reporting on this Output for this Annual Report

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 after 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 producers indicating adoption of recommended practices (continued).
6	Number of producers indicating adoption of recommended practices (continued)
7	Number of crop and livestock producers who increase their knowledge on marketing, insurance, or USDA program alternatives that are consistent with the risk bearing ability of their businesses and their personal preferences for managing risk.
8	Number of people interested in local food production and marketing who received MarketReady Training.
9	Number of start-up businesses that show economic benefits from Extension recommendations.
10	Research findings provide science that can be used to make Midwest agriculture more resilient and/or increase agricultural production capacity.
11	Number of poultry farms receiving assistance to evaluate USDA compensation for losses from Highly Pathogenic Avian Influenza
12	Number of new and under-served target audience members served
13	Number of producers and feed manufacturers educated about the new Veterinary Feed Directive
14	Pounds of fruits and vegetables grown by Master Gardeners and donated to Iowa food pantries.

Outcome #1

1. Outcome Measures

Number of producers indicating adoption of recommended practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1072

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. There was a stark contrast in the beef cattle market between the beginning of 2015 and end of 2016. 2015 was a year of transition as the markets turned the corner from upward-trending prices to cyclically lower prices because of the growth in cattle inventories. Many cow-calf operations that expanded their operations during the time of record high-priced replacement heifers in 2014 and 2015 are now scrambling to pay for those females with low calf price levels not seen since the fall of 2013. Longevity is going to be the key to profitability when it comes to replacements that entered the herd over the past two years.

B. Over one-half of Iowa farmland is under some form of lease agreement and farmland leases are an on-going discussion between tenants and landowners. After a statewide average peak in 2013 cash rents of \$270 per acre on corn and soybean, the 2016 statewide value was 15 percent lower at \$230. USDA Economic Research Service forecasts farm profitability to decline by an estimated \$90.1 billion in 2016. This is the third consecutive year of decline and the lowest since 2009. After multiple years of tight to negative margins, there is intense pressure. Both tenants and landowners have seen an increase in their living expenditures, and landowners have been doubly impacted as they rely on farm rent as a source of income.

C. Iowa ranks fourth nationally in number of cattle on feed and produces over 2,000,000 head of feedlot cattle on just more than 6000 individual operations annually. Cattle-feeding is regarded as a high-risk enterprise. In recent years, producers have invested in significant feedlot growth only to see the market collapse in 2015. Making sound decisions to ensure operation sustainability, impacts their financial and environmental risk.

What has been done

A. The Iowa Beef Center conducted the third part of a heifer development series which focused on selection and management practices that can enhance longevity of the female in the beef herd. This segment of the program complements two previous heifer development programs which were distributed as video on YouTube. In addition, 'Net Present Value' and 'Buy or Raise' online decision tools were developed to assist producers in heifer acquisition decisions.

B. Program evaluations from the previous year showed that there was a need for leasing education programs. Farm management specialists hosted many meetings for landowners and tenants as well as farm managers and ag lenders across Iowa. 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. Leasing discussions were also a component of other programs, such as Annie's Project and Crop Advantage Series. With increasing numbers of out-of-state landowners, eight educational videos and online publications provided other methods to access information on leasing topics.

C. The 'Beef Feedlot Systems Manual' was updated in 2014 to reflect current facility costs and new research related to cattle performance in different types of facilities. In 2015, 11 workshops were held across the state to disseminate this new information and educate beef producers on the costs and benefits of various facility types. A series of videos posted on YouTube provided the same information and an online facility cost calculator was created for individual comparisons.

Results

A. Seven locations of the heifer development series were attended by 235 people. The post-meeting evaluation said their knowledge of heifer retention economics was improved, and 94% said their knowledge of new selection indexes for udder and foot scores was improved. Thirty-nine percent and 37.5% of participants said they plan to implement udder scoring and foot scoring, and 30% plan to calculate the 'Net Present Value' of their own females. Since this program, the 'Net Present Value' of replacement females decision tool has been downloaded more than 1700 times, the 'Buy or Raise' replacement heifer decision tool has been downloaded more than 5400 times, and the heifer development videos posted on YouTube videos have been viewed more than 13,500 times. Change in producer knowledge as a result of this program will lead to an increase of beef cow retention and increased profitability for cow calf producers, resulting in a strengthened Iowa agriculture and enhanced local economy.

B. Eighty-seven farmland leasing programs were attended by 2,100 participants. A post-survey showed participants intended to make changes as a result of the program, including decreasing rent (44%), improving communication with other parties in leasing agreements (39%), and implementing new conservation strategies (20%). Fifty-six percent of the participants were non-farming landowners who would not be the target audience of other agricultural Extension program efforts. The most common reason for attending was to increase knowledge on leasing arrangements and 96% indicated they were satisfied the meeting met their expectations. Popular publications on leasing were downloaded over 415,000 times, and new videos received 3,176 views. As indicated by follow-up questions and phone calls that followed the farmland leasing meetings, there are clear indications that more information is being shared between parties regarding the tenant's cost of crop production.

C. The 'Beef Feedlot Systems Manual' has been downloaded more than 11,000 times. More than 200 producers participated in the workshops with 54% indicating an increase in their knowledge of financial risk and 60% showing an increase in their knowledge about facility and weather impacts on cattle performance. Ninety-seven percent said they had a better understanding of the

tradeoff between facility investment and economics of cattle performance and manure value. A six month follow-up showed 30% of the respondents used workshop information to manage risk, while 35% analyzed financial risk, operating costs, cattle performance, and manure value for their operation. Twenty-eight participants said they had or were considering building or remodeling feedlot facilities, and 19 were planning to make changes in their operation to improve environmental stewardship. Participants also shared information from the workshop with another 560 individuals. Over 100 copies of the facility calculator have been downloaded. Six users replied to the online survey and said it helped them evaluate and make decisions on building feedlot facilities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
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.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	258

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pest resistance, specifically herbicide resistance, is a primary programming focus of the ISU

Extension and Outreach crops team and a significant issue in Iowa agriculture. According to a 2014 survey conducted with pesticide applicators in Iowa, Kansas, Nebraska, and North Dakota, 84% of the 1,180 farmers surveyed indicated a need for more information or support on managing herbicide resistance and herbicide-resistant weeds. Programming has indicated that using resilient weed management programs may cost more than continuous use of glyphosate-based programs or those with herbicides used at low rates, but they may be less expensive than managing resistance once it occurs.

What has been done

In 2015 and 2016, Extension specialists developed and held a 'Weeds Week' program attended by a total of 339 during the two years. In 2016, 38% percent of attendees were farmers and 44% were retail ag suppliers, the target audiences. The program, delivered in half-day workshops, was aimed at providing tools that help farmers and ag retailers develop long-term weed management plans that identify sites of action, promote timely application of herbicides and avoid the expenses of dealing with herbicide resistance. Education methods included worksheets, audience participations activities, slide presentations, herbicide demonstration plots designed to be used as a part of the curriculum, and management plan evaluation materials. Financial assistance was received from the Take Action committee to assist in the delivery of this program.

Results

Farmers who participated in Weeds Week workshops developed skills to fight herbicide resistant weeds in their fields and reduce the spread of additional weed-resistance, while simultaneously improving their profits. One hundred and fifty attendees completed surveys showing what changes are being made on their operations: 84% are selecting herbicides and herbicide rates that are more effective on weeds of concern, 60% are designing herbicide programs that use multiple modes of action; 75% said they will implement changes they learned on 250 or more acres; 65% estimated increased profits of \$5-\$20 per acre, and 11% of attendees estimated they would profit over \$20 per acre after attending a Weeds Week workshop.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Number of producers and landowners who adopt BMPs after 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 producers indicating adoption of recommended practices (continued).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	317

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

D. Food safety, antibiotic resistance, animal well-being, and welfare-certified pork are becoming increasingly important issues to swine producers and consumers of pork. In October 2014, the Professional Animal Auditor Certification Organization (PAACO) certified a new, uniform swine audit platform for pork producers, packers, and processors. While implementing the new welfare and food safety standards are important to the consumer as well as the producer, the audit platform requires extensive documentation and adoption of rigid food safety and animal well-being standards. The process is burdensome, especially for smaller independent swine producers and has caused concern for Iowa producers who may not be able to address the audit requirements. Completing the uniform swine audit, documenting higher food safety and animal welfare standards, is good for pork consumers and beneficial to the Iowa economy because of the amount of pork produced in the state.

E. Antibiotic resistance is a key issue in today's society. Livestock producers use antibiotics delivered through feed to maintain and manage animal health. Although livestock production is not considered a large contributor to antibiotic resistance, it is in society's interest to only use antibiotic treatments when absolutely necessary for animal well-being and food safety. Previously

about 95% of livestock antibiotics used did not require veterinary oversight. As of January 1, 2017 antibiotics considered to be medically important (needed to treat humans) requires additional veterinarian oversight as mandated through the Food and Drug Administration. This significant change impacts animal husbandry strategies and requires diverse educational efforts to help producers understand the new requirements and implement changes. This was also an opportunity to help producers reduce antibiotic usage by improving their husbandry skills. Producer education is essential to correctly adapt to the new regulations affecting livestock production.

F. Transition dairy cows are defined as animals who are pregnant and are within a period from 30 days prior to calving to 30 days post calving. While transition cow management encompasses only 20-30% of the herd at a time, it can ultimately influence the milk production and health of 100% of the cow herd. Many metabolic and infectious problems as well as issues that can decrease animal health and performance result from deficiencies and challenges in transition cow feeding and management. A 2012 Iowa survey showed dairy producers are highly interested in learning more about transition cow management and facilities.

What has been done

D. In order to address the concerns of Iowa's swine producers about complying with the requirements of the new audit platform, ISU Extension and Outreach swine specialists collaborated with the Iowa Pork Producers Association to develop a common, swine industry audit workshop. The workshop included a supplemental record-keeping notebook and checklist to ensure compliance with audit documentation requirements. The 24 workshops were attended by 389 operations and system flow managers. Pre-workshop knowledge was collected with audience response software, a post meeting survey was completed and a six month follow-up survey was completed by a sample of 51 workshop participants.

E. A series of meetings were held across the state to inform producers of the changes in antibiotic usage regulations. Four regional swine conferences, attended by 100 producers, included education on the phase-out of using medically important antibiotics for growth promotion by requiring a veterinary feed directive. Nine workshops, addressing the same issues were attended by 271 producers. Further education efforts were achieved through another 15 regional livestock meetings held in the summer and fall of 2016, reaching an additional 764 producers. The topic was also presented and discussed at the Iowa State James McKean Swine Veterinary Conference reaching 317 participants. Additional information posted on the Iowa Pork Industry Center website was downloaded 703 times in the last six weeks of 2016.

F. With the support of a USDA Risk Management Education grant, received by the ISU Extension and Outreach dairy team, an extensive 18 month program on transition cow management was developed. A survey was sent to producers to learn more about management practices. The results were summarized and used to create programming to educate on the state of transition cow practices and principles in the Iowa dairy industry. Seven on-farm, hands-on workshops were developed and conducted for dairy producers, dairy consultants, and industry personnel. Transition cow management was also the focus of nine day-long events. Three video modules were developed and delivered on YouTube with three additional modules under development. Sixty individual herd visits were conducted with 48 producers working on transition cow projects. A post workshop questionnaire was conducted and an online survey was conducted 4-8 weeks after the workshops to evaluate impacts. A online survey was sent to 55 dairy producers who participated in individual farm consultations to assess changes and impacts.

Results

D. Post workshop data indicate that 86% of participants now have at least some confidence in passing the audit with minimal non-compliance issues. Post workshop, 94% report at least some confidence that they will be able to confirm insensibility, a requirement to pass the audit, up from 91% not knowing more than half of the indicators of insensibility. Successful education to help producers prepare for the audit is important to both consumers and producers, resulting in improved animal wellbeing, continued protection of safe food supply, market access and economic survival of independent swine producers that contribute to the local economy.

E. Livestock producers reported on post-meeting surveys that they are likely to improve communications with other producers, veterinarians and feed distributors. They also report that they would improve or establish a veterinarian client patient relationship, an important component of the new regulations facilitating proper veterinary oversight and legal records keeping. Ninety-six percent said they are likely to use antibiotics more judiciously. Additionally, a sample of participants (n=240) are going to develop a plan for maintaining Veterinary Feed Directive paperwork and improve record keeping. Of the 240 survey respondents, 226 plan to make management changes to reduce animal stress and disease pressure, further reducing the need for antibiotic use. Other comments made by producers include a focus on probiotic, nutrition and minerals for disease prevention. Follow-up survey responses verified changes in producer behavior to maintain compliance that was facilitated by workshop participation. As example, one producer's statement underscores the importance of the workshops, "I thought the workshop was time well spent. There was no silver bullet, but the common sense things like stress, ventilation, vaccine management, environment, other feed additives, bio-security, genetics and stocking density were all areas that were covered and they are just little things that help lower the need for feed additives."

F. The seven on-farm dairy workshops included 160 dairy producers and industry personnel who account for about one-fourth of Iowa's dairy industry. Post workshop survey showed:

- * 93% rated the workshops very good to excellent and the content as valuable to extremely valuable
- * The 4-week post workshop survey results (60% dairy producers; 40% industry) showed:
 - > 42% overall knowledge gain in all educational areas of the workshop.
 - > 57% had made changes in their transition cow programs
 - > Individual economic impact included less udder edema and metabolic problems, lower veterinary costs, higher dry matter intake, increased production, and healthier calves with decreased calf mortality.
 - > 43% stated they were in the process of making changes, including many new and remodeled facilities.
 - > Four national articles in Hoard's dairyman and Progressive Dairyman which amplified the educational impact.
 - > Over 20% of all cows in the Iowa dairy industry were represented in this survey. Data shows transition programs result in \$400 more income/cow, or the potential of \$16 million gain.
- * Survey results where individual consultations were made (25% response rate to date) show:
 - > Reduced incidence of metabolic disorders
 - > Less cases of metritis and cows getting milk pounds in the tank faster
 - > Over 2000 pounds more milk, reduced metabolic disorders by 60%, hope to increase dry matter intake by 3-4 pounds and reduce calf mortality by 20%.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

305	Animal Physiological Processes
311	Animal Diseases
401	Structures, Facilities, and General Purpose Farm Supplies
601	Economics of Agricultural Production and Farm Management
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #6

1. Outcome Measures

Number of producers indicating adoption of recommended practices (continued)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2314

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

G. Workers who mix, load, or apply pesticides (known as pesticide handlers) can be exposed to toxic pesticides due to spills and splashes, defective, missing or inadequate protective equipment, direct spray, or drift. Pesticides pose risks of short- and long-term illness for these workers. Additionally, improperly applied pesticides can cause harm to non-targeted crops, animals, bees, and other pollinators, and the environment.

H. Iowa has approximately 18,000 farms under 50 acres. These rural clients are working off-farm or are retired and need practical information available from ISU Extension and Outreach. The Small Farms program exists to connect these rural residents with practical information and specialists in areas of expertise.

What has been done

G. The 2015 Commercial Ag Continuing Instruction program provided information on best management practices for spray droplet size and drift reduction, handling pesticide containers, Worker Protection Standard implementation, paraquat safety, herbicide carryover, sprayer system contamination, and pest management. The information was delivered through prerecorded programs at county extension offices and through live programs to 3459 applicators across the state.

H. The Iowa Small Farms Conference was held February 13, 2016, on the Iowa State University campus. The conference, attended by 112 individuals, offered 15 breakout sessions for participants. Session topics included: establishing an orchard, timber management, polyface farm, season extension, value-added forestry, Iowa Monarch Conservation Consortium, small-scale machinery sharing, on-farm renewable energy, getting started with bees, taking your recipe to market, ancient grains, wildlife habitat management, transitioning to organic, small farm resources from Farm Service Agency and Natural Resources Conservation Program, and commercial poultry production. A survey of Acreage Living newsletter subscribers illustrated that those receiving the newsletter are reading the articles and rating the usefulness of the newsletter as very high.

Results

G. Effective spray application while reducing drift potential was a major focus of the pesticide applicator program. In a post-program evaluation, 2,314 out of 2,365 respondents indicated they "select nozzle size and pressure to produce larger spray droplets to reduce drift potential" and 2,018 increased their knowledge of the effect of sprayer speed on pressure. Of the attendees surveyed, 2,196 agreed or strongly agreed that they increased their understanding of the Worker Protection Standard. One focus of the pest management portion of the program was on weed resistance to herbicides and using the Take Action Herbicide Classification Chart. When asked how effective that session was, 2,248 indicated their knowledge of using the Herbicide Classification Chart for weed resistance management increased. Additionally, 96% of survey respondents said they took precautions to protect bees and other pollinators, and almost the same percentage indicated they cleaned spray booms when changing pesticides to reduce contamination to crops from future applications of pesticides.

H. Fifty-six program evaluations were received at the conclusion of the Small Farms conference. Overall, conference sessions were ranked as very useful or somewhat useful. Common comments included: "was almost too much information to take in" and "a very good overview of advantages/disadvantages." Further analysis of the comments reveals that the information provided to participants was consistently a very practical overview of the enterprise that could be added to any small farm or acreage. When asked what changes they would make after attending the conference, thirty-two of the respondents indicated they would be making some changes or modifications to their small farm based on the information they received at the conference. The additions of an orchard, bee hives and high tunnels were the most common changes indicated. Fifty-six percent of the Acreage Living newsletter readers indicated they were researching a topic further because of what they read in the Acreage Living newsletter.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
205	Plant Management Systems
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #7

1. Outcome Measures

Number of crop and livestock producers who increase their knowledge on marketing, insurance, or USDA program alternatives that are consistent with the risk bearing ability of their businesses and their personal preferences for managing risk.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	475

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Grain prices have steadily declined from historic highs. The 2012 marketing year average for corn (September 2012 through August 2013) was an all-time high of \$6.92, but in 2015 the marketing average was almost half as much, at \$3.50. Soybean shows a similar picture with a historic record of \$14.40 for the 2012 marketing year and a 2015 average of \$8.91. There was a potential window of profitability in livestock production depending on the current cattle cycle and its strength. Data from the Iowa Farm Business Association showed farms lost over \$82,000 in working capital from 2015 to 2016; projections show farm income will fall another 30% in 2016. After multiple years of record profitability, renewed focus is required on marketing risk management to mitigate losses at the farm gate and up and down the ag supply chain.

B. According to the 2012 USDA Census of Agriculture, 25% of Iowa farmers are women. Women own 47% of the land in Iowa. Women demonstrate exceptional contributions to managing and working with livestock and farmland and providing professional agricultural services.

What has been done

A. Farm management specialists reviewed, revised, and developed educational materials on marketing basics, marketing programs, and marketing techniques. These and the grain and livestock market outlook were presented across the state. In addition to existing materials, online videos were created to address market fundamentals. Marketing clubs provided an environment for extension specialists to teach marketing fundamentals and allow participants to discuss marketing plans through the season with other producers. In addition, thirteen regional agricultural outlook meetings were held with speakers covering topics that included grain and livestock marketing, land values, international ag, and farm profitability.

B. In 2016, the ISU Extension and Outreach Women in Agriculture program held 11 classes targeting women involved in agriculture and reaching 107 participants. Additionally, the "Women Impacting the Land" project was launched to recognize eight Iowa women implementing conservation habits on their farm. Staff visited each woman at their farm business to capture their stories on video and share the stories on Facebook and Twitter. The project garnered 1,188 views on YouTube and 953 views on Vimeo. Staff developed and distributed 2,000 booklets providing talking points for engagement with visitors at the national Farm Progress Show.

Results

A. Regional farm outlook meetings had 475 participants, with a 27% increase in knowledge on marketing topics as noted in pre and post assessments. Grain marketing programs and marketing clubs impacted another 3,362 attendees. Online videos addressing marketing fundamentals were viewed 3,154 times. We assisted with the establishment of marketing clubs, small groups of 15-30 individuals who meet throughout the year. Participants developed marketing plans for their operations and learned how to integrate crop insurance into their marketing plans and mitigate risk for their farm business. These small groups create a learning environment with a large impact. In one marketing club alone, over 15,000 acres, which can produce an estimated 3 million bushels of corn, were marketed within the group. Improving the sales price by an average of \$.10 per bushel resulted in \$300,000 more revenue for the group's participants.

B. As a result of the Women Impacting the Land project, the number of course offerings for 2017 has increased from 10 to 12. The increased interest coincides with greater awareness of the ISU Extension and Outreach Women in Ag program, as well as recognition by county staff that women in ag are an untapped audience in learning opportunities that include production, marketing and business planning. The Women in Ag program has delivered 136 farm management courses and provided more than 2,000 hours of instruction. This level of education enables Women in Ag participants to continue impacting the economy of Iowa -- which according to USDA is a \$474 million in economic impacts in Iowa.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #8

1. Outcome Measures

Number of people interested in local food production and marketing who received MarketReady Training.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	88

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The increased interest in local foods by consumers has resulted in increased demand for local foods from wholesale and institutional buyers. Iowa has a limited number of producers at that scale.

What has been done

ISU Extension and Outreach specialists in the Value Added Agriculture Program held two, day-long workshops called "MarketReady" in 2016 in which local food producers (fruit, vegetable, meat, dairy, and egg) learned about production and marketing strategies to scale up to meet the volume and food safety requirements of wholesale buyers. Eighteen producers attended the workshop, co-sponsored by Healthy Harvest of North Iowa, in Mason City. Seventy fruit and vegetable producers attended the day-long session at Great Plains Growers' Conference in St. Joseph, Missouri.

Results

Discussions at the MarketReady workshop in Mason City identified a need for more collaboration between growers and wholesale buyers in North Iowa. The workshop directly led to the formation of a small food hub, North Iowa Fresh, and a focus group investigating the value chain in the area and opportunities to increase the availability of locally produced fruits, vegetables and protein. North Iowa Fresh received an Iowa SARE mini-grant to support their meetings and research. The Iowa SARE coordinator is an ISUEO program specialist and works closely with mini-grant recipients.

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

Number of start-up businesses that show economic benefits from Extension recommendations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Improving Iowa's rural businesses is good for rural Iowa's economy.

B. Food hubs are viewed as critical links for regional food system development in two key ways: 1) providing important services for small- and mid-sized farmers through product marketing, brokering volume sales, coordinating distribution logistics, and helping producers meet industry requirements in areas such as food safety and packaging; and 2) making local foods more affordable and easily available to consumers by bringing local foods to grocery stores, institutions (schools or hospital cafeterias), and restaurants. Food hub organizations and businesses, such as the four in Iowa, face many challenges to solvency as they attempt to balance seasonal supply and demand in addition to changing markets and food safety regulations.

What has been done

A. Nine feasibility studies were conducted to examine the economics, management, technical, marketing and financial aspects of a business, and improving the business plan prior to the start of the business, thereby improving the opportunities for success of that business.

B. To address the technical challenges that Iowa food hubs are experiencing, the local foods program worked to meet the needs expressed by these businesses by conducting research and producing five publications that provide relevant tools for greater economic success, developing and continuing to facilitate the Iowa Food Hub Manager's Working Group fostering peer-to-peer support, and connecting working group members with the requested technical expertise to help troubleshoot additional challenges and barriers.

Results

A. The results from nine feasibility studies showed a total investment in Iowa of \$58,576,000. Ninety-six new employees were added to Iowa's rural payroll.

B. Development and continued facilitation of the Iowa Food Hub Managers Working Group has led to new partnerships and improved business practices among food hubs in Iowa. One of these improved business practices is that three food hubs and several farms in Iowa coordinated their trucking routes so that they could cross-dock at one another's locations and haul product for each other. This has reduced redundancy, increased efficiency, provided better service to producers, and reduced their operating costs. With connections made in the working group, two food hubs are now partnering to expand USDA's GroupGAP Food Safety Program to more farmers.

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

Research findings provide science that can be used to make Midwest agriculture more resilient and/or increase agricultural production capacity.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Skillful prediction of climate variability and change is necessary to inform farm and farm policy decisions regarding adaptation and resilience of agricultural systems in a changing world.

B. The soybean cyst nematode (SCN) is widely distributed throughout the region and is recognized as the major, yield-limiting pathogen of soybean, a crop that contributes \$18 billion annually to the economy of the nation. Two main management tactics currently being used are resistant soybean cultivars and nematode-protectant seed treatments.

C. The shoot apical meristem (SAM) contains a group of "stem cells" and is the control hub for plant aerial growth and development. The SAM is situated at the tip of shoot axis of a plant and is responsible for the development of all above ground organs such as leaves, lateral shoots and flowers. It is essential for the SAM to operate on a precise mechanism to maintain the pool of stem cells while the stems cells are recruited away to differentiate into organs upon genetic and environmental cues. The plant will stop its growth and development if the SAM runs out of stem cells. However this regulatory mechanism is not fully understood.

D. It is estimated that reproductive failure costs the cattle industry (beef and dairy) in excess of \$2.5 billion annually. Previous research in dairy cattle has linked excess dietary protein with decreased fertility. While it has largely been accepted that a similar relationship exists in beef

cattle, there has been little if any large scale research to support this.

E. Poultry products (eggs and meat) provide a major source of animal protein for human consumption; however, infectious disease reduces animal health and the efficiency of production, and can jeopardize food safety. To enhance the health of animals and to provide a permanent and environmentally friendly approach to host resistance to disease, methods must be found to genetically improve disease resistance and immune function in poultry.

F. Western corn rootworm is the most serious pest of corn in the United States Corn Belt. Each year US farmers suffer economic losses in excess of one billion dollars, as a result of yield losses and management costs associated with western 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).

G. Animal management and production is constantly challenged by environmental factors such as feedstuff composition and nutrition, pathogens, erratic climates (e.g., heat stress, cold stress) that result in suboptimal nutrient digestion and utilization. These antagonistic forces influence nutrient and energy metabolism and utilization that can negatively influence reproduction, growth, milk and egg production, wellbeing, health, product quality and profitability of animals

What has been done

A. We conducted regional climate simulations of changes in rainfall caused by large-scale changes in crop type and irrigation. On fundamental level new data were collected and modeled that show how key photosynthetic processes, including photorespiration, would change under future climate and CO₂. We also completed several studies that identify how biomass crops would impact the water balance and water quality in the Central US. A remote sensing study was completed which will lead to better detection of soil moisture and crop biomass as we progress toward developing evaluating advanced algorithms in key agricultural regions. We also have produced and analyzed the first ever measurements of surface heat and moisture fluxes in an operational wind farm co-located with intensively managed crops.

During this reporting period we developed and launched an on-line decision support tool (FACTS - Forecast and Assessment of Cropping Systems; <http://crops.extension.iastate.edu/facts/>) that disseminates agronomic information to farmers and scientists in real time.

B. Field research was conducted in this project to determine the potential usefulness of resistant soybean cultivars and nematode protectant seed treatments in reducing yield loss from SCN.

c. We used maize (corn) as a model organism to study the regulatory mechanism and function of the SAM. We developed and optimized a new Genome-Wide Association Study (GWAS) method: eRD. We compared eRD with several other GWAS methods by validating candidate genes using Mu-insertion mutant stocks.

D. Iowa State University animal scientists, along with multiple collaborators at other institutions, conducted research that suggests excess dietary protein in beef cattle diets is not linked to suppressed fertility. In fact, data from a series of studies conducted supports a notion that excess dietary protein may be beneficial in reproductive function in the beef cow.

E. We researched the genomics and immunology of host response to Avian Pathogenic *E. coli*.

F. Extensive research was 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 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.

G. We evaluated new and known feed ingredients for nutritional and digestibility properties for swine, beef, sheep and poultry.

Results

A. Project findings can be used to inform future research focused on how to modify major crops and wind turbine placement among crops so as to minimize crop losses under future climate.

The publically available web tool has been well received (> 7500 users; June 16 to Oct 31, 2016) and provided crop yield forecasts as well as predictions of soil water and nitrogen successfully (error less than 10%) to the end users. The FACTS web tool, which integrates experimental research and cropping systems modeling, has shown the path for development of more web decision tools to inform farmers and policy makers.

B. The results revealed that some resistant soybean cultivars are able to produce profitable yields and also suppress build-up of SCN numbers in the soil, but other cultivars do not produce the high yields and/or provide suppression of SCN reproduction. Similarly, the field research with seed treatments showed that increased yields and decreased SCN reproduction was possible through use of the nematode-protectant seed treatments, but results were not consistent among locations within a year or from year to year. The results of this research provide information that Iowa soybean farmers and agribusiness personnel who advise them can use to make SCN management decisions for future years.

C. Our results showed that eRD is the most accurate among the methods we compared. This new method can be adapted and used by other researchers conducting GWAS analysis to obtain results with higher accuracy.

D. Producers will utilize this information to more appropriately meet the nutritional demands of beef cattle, thus increasing reproductive efficiency and supporting a more sustainable beef production model.

E. Our findings are valuable to commercial poultry breeders who 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.

F. Research 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.

G. This is helping animal agriculture by reducing feed and production costs, keeping the cost of food as low as possible and minimizing the quantity of feed resources required to support the production of animal food products. Further, we are aiding in the development of nutritional management strategies that optimize animal production, health, and wellbeing that also contributes to sustainable and eco-friendly production practices. This work is also impacting our

understanding and improvement of animal product nutrient composition and the role animal-based products have in human health. As we share our findings, it will lead increased consumer confidence in animal products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
132	Weather and Climate
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
311	Animal Diseases

Outcome #11

1. Outcome Measures

Number of poultry farms receiving assistance to evaluate USDA compensation for losses from Highly Pathogenic Avian Influenza

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	58

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

During 2015, Highly Pathogenic Avian Influenza (HPAI) resulted in the loss of more than 30 million layers and pullets (chickens) and 1.5 million turkeys in Iowa from infection or depopulation due to exposure to the virus. Seventy-seven (77) poultry production sites across 18 Iowa counties were impacted by HPAI. A study commissioned by the Iowa Farm Bureau Federation estimated Iowa's economic loss at \$1.2 billion. These Iowa producers, as well as their employees, faced

multiple impacts including: 1) immediate and longer-term financial loss; 2) emotional hardship stemming from financial loss as well as the shock of losing their livestock and daily routine; and 3) stress of dealing with the logistical process and working with agencies such as the U.S.D.A., other governmental agencies, local lenders, and other business partners.

What has been done

With one week's notice, Extension farm management specialists relocated to northwest Iowa for three weeks. They met with poultry producers associated with 58 of the 77 premises affected by HPAI to develop, improve, or make final adjustments to the USDA-APHIS Work Plans and Financial Plans that outlined the steps necessary to prepare and finance the operation's return to productivity. In-person meetings involved individuals, couples, parents and children, siblings, and business partners working with Extension staff. Some visits were truly one-on-one while others involved as many as four interested parties and the Extension specialist.

Results

ISU Extension and Outreach farm management specialists observed varied outcomes related to the financial losses, emotional hardships, and stressful impacts related to the devastation of HPAI on their poultry operations. Assistance from Extension specialists helped producers move through the restoration process more quickly, reducing financial losses. For example, when the estimated out-of-production period could be reduced by even ten or twenty percent, this resulted in producers moving back into production more quickly and reducing overall financial losses. Specialists also assisted producers in determining the value of compost and if it could be a revenue stream. They were able to provide skills to buffer the interactions between producers who had just suffered the emotional impact of watching their poultry/livestock suffer and be destroyed, and were trying to take practical steps to rebuild their businesses. Over three weeks in July 2015, farm management specialists worked with 58 premises. The final USDA-APHIS updates provided to staff showed financial plans were approved for 56 of the 77 premises and recorded comments indicated progress on all financial plans for the remaining premises.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

Outcome #12

1. Outcome Measures

Number of new and under-served target audience members served

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	517

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One measure of the success of correctional facilities is keeping recidivism (return to prison) rates as low as possible. Recidivism is often linked to skills inmates gain and the positive interactions they have during incarceration, in addition to their ability to gain employment and be a working member of the community upon release. At the Iowa Correctional Institution for Women, Iowa State University and ISU Extension and Outreach are working with prison staff to train inmates how to farm and raise their own food for personal health and financial security, and as a career option which can help prevent them from reoffending and contribute to the economic development of Iowa.

What has been done

In 2016, the local foods program, along with Iowa State University Landscape Architecture faculty and students, trained 17 inmates on planning, planting, maintaining, and harvesting a vegetable garden. This included both classroom trainings with ISU Extension and Outreach staff, as well as field training during the growing season. The garden crew asked for a portion of the produce to go to the local food bank to help address local hunger.

Results

There were several remarkable results to the training and gardening effort at the institution. Results included: 1) the garden crew was able to grow over 8,000 lbs. of vegetables (including 3,000 lbs. of tomatoes, 1,700 lbs. of potatoes, 1,000 lbs. of eggplant, 300 lbs. of watermelons and muskmelons) in 2016. 1,000 lbs. were donated to area food pantries, while 7,000 lbs. were used in the prison dining services; 2) with skills gained through this program, two women from the garden crew, when released from prison, were able to get living-wage jobs in the landscape/farming sector; 3) the garden crew self-organized food tasting events for over 500 inmates and staff members to provide more education about some of the more non-traditional varieties of produce that were being grown, resulting in overwhelming positive feedback that people were more likely to try different varieties of produce now that they were more familiar with them.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems

Outcome #13

1. Outcome Measures

Number of producers and feed manufacturers educated about the new Veterinary Feed Directive

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	553

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In response to growing concern about antibiotic resistance in human medicine, the Food and Drug Administration has developed rule changes designed to force more veterinary oversight and more judicious use of antibiotics in animal agriculture. As a result, new FDA rules will require changes in how, when, and why feed additive and water soluble antibiotics are used in livestock production. The Veterinary Feed Directive changes the way medically important antibiotics are purchased and used. Livestock producers, veterinarians, and feed distributors must be well-educated about the rule changes in order for them to be in compliance with FDA regulations and to ensure access to antibiotics important for animal health and well-being.

What has been done

ISU Extension beef team and Iowa Farm Bureau coordinated 11 meetings across the state, followed by a webinar and 11 additional local meetings to educate livestock producers, veterinarians, and feed distributors on the new regulations and implementation processes, as well as the judicious use of antibiotics in feed. In addition, a webinar was produced in cooperation with Iowa Farm Bureau, a centralized website was also developed to provide quick access to resources related to the new antibiotic use regulations; and a podcast was broadcast with ISU Extension and Outreach's small farms project.

Results

More than 553 people attended the meetings focused on the new requirements of the Veterinary Feed Directive. End-of-meeting evaluations showed that more than 90% of participants increased their knowledge of the new regulations, gained information required by the new directives, and understood the responsibilities of producers, veterinarians and feed distributors. Ninety-one percent plan to improve the communication they have with the other parties, including producers, veterinarians, and feed distributors. Survey results also showed that 81% plan to be more judicious in their antibiotic use, and 83% plan to improve their record keeping as it relates to

antibiotic use. The webinar had 20 participants and 152 views to date of the recording. The podcast has about 400 regular listeners and the website has had more than 550 hits to date.

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 #14

1. Outcome Measures

Pounds of fruits and vegetables grown by Master Gardeners and donated to Iowa food pantries.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	58000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Americans who frequent food pantries rely heavily on the food available there. As food insecurity increases, consumption of fresh produce decreases. Research has shown that youth from low-income households consumed fewer fruits and vegetables as well as a limited variety of produce. American food insecurity is also related to obesity--women who experience food insecurity are more likely to be obese compared to women who are food secure. Hunger is a particular issue in Iowa where it has been reported that one in eight Iowans is food insecure. Food insecurity across Iowa is a growing problem. A recent survey of the Iowa food pantry clients showed that there is lack of availability of fresh produce, which is critical to human health and nutrition. These food pantries receive higher volumes of boxed and canned products, but do not receive fresh produce. To assist the low-income households to increase consumption of fresh fruit and vegetables, more fresh produce need to be produced and donated to food pantries.

What has been done

The Supplemental Nutritional Assistance Program Education (SNAP-Ed Program) collaborated with the ISU Extension and Outreach Master Gardener program to address the growing problem of the lack of health and well-being among low-income households that rely on food pantries. To begin, ISU Extension and Outreach developed a series of training modules with a goal of

providing continuing education to 300 Iowa Master Gardeners on fruit and vegetable production. Second, competitive mini-grants provided funds for Master Gardeners to grow fruits and vegetables, which were donated to food pantries. This resulted in building relationships between Master Gardeners and local food pantries to improve access to produce.

Results

Fifty-nine mini grant applications were received by the Master Gardener program and 26 received awards.

* \$21,000 in mini-grant funds were awarded to 16 ISU Extension and Outreach Master Gardener county programs serving over two dozen communities.

* Master Gardeners participated in workshops on gardening so that they could grow produce and donate to food pantries that assist low-income audiences.

* Over 58,000 pounds of produce were donated by Master Gardeners to 50 nearby food pantries and food banks

* The amount of contributed food equaled 174,000 servings of fruits and vegetables being donated to local food pantries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Consumer trends and preferences)

Brief Explanation

- An external factor that demanded this program was the arrival of Avian influenza in Iowa, with no vaccine, treatment, or prediction on which sites would be infected. Unprepared for a large scale outbreak, procedures for clean-up, decontamination, and compensation were being developed and adjusted as producers were simultaneously trying to make decisions for their operation. This situation required constant review of new procedures and a need to quickly adjust plans as new regulations were finalized. Previously-planned events by the involved specialists were cancelled or reassigned to other staff, creating duty reassignment not only in the impacted area, but by staff in all areas of the state.

- Weather conditions and policies at the prison were the largest external factors providing challenges for training and affecting outcomes. Policies such as the prison doesn't allow inmates to use gardening and external forces such as the weather, impacted outcomes.
- Implementation of FDA's Guidance for the Industry 209 and 213 will have a significant impact on livestock producers starting January 1, 2017, with the requirement of veterinary feed directives for feed antibiotics and prescriptions for water antibiotics for production animals. It will require a much closer relationship and more communication between the producer, veterinarian, and feed distributor; and will require more advanced planning in regard to the potential need for antibiotics. In addition to livestock producers, veterinarians and feed distributors will be greatly impacted by implementation of the VFD rules.
- Weather conditions influenced crop production, which led to lower yields in certain crops. It was also noticed that certain crops such as eggplant were not popular at food pantries. Clients did not take them primarily because of lack of information on how to cook the vegetable.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Teams within ISU Extension and Outreach Agriculture and Natural Resources program follow program development criteria that include these elements: needs assessment, learning objectives, educational methods to achieve the objectives, and evaluation to assess learning and behavioral change outcomes. Evaluation results of all our activities in the Food Security program are too numerous to list. Therefore, in this section, we present program evaluation data from **one team project** that demonstrates application of the essential program development criteria. The criteria include:

Common Swine Industry Audit Workshops (Reported under Outcome Target #1- Number of producers indicating adoption of recommended practices)

The Swine Extension team assessed the concerns and knowledge levels of swine producers facing the industry-enforced certification audit. Based on needs assessment data, team members collaborated with Iowa Pork Producers Association to develop a workshop.

Pre-workshop knowledge assessments for the common swine industry audit, workshops showed that many had inadequate knowledge or insufficient applied practice of recommended humane management 'best practices' before the prior to the training. Assessment data indicated that a high percentage of attendees would fail the audit due to low knowledge level in the critical areas of animal handling, record-keeping, and humane euthanasia method.

Development and Delivery: Guided by the data on knowledge and practice levels of producers in the industry, team members developed workshop curriculum, and delivered the training and materials to 389 system-flow operators/managers at 24 workshop sites around the state.

Six month post-workshop survey was conducted to assess changes in participants' (N=51): 86% are at least somewhat confident they can now pass the audit and 88% are confident or very confident they can pass with minimal non-compliance issues, indicating marked improvement over pre-workshop assessment data.

Value of workshop training and outcomes: Successful education to help producers

prepare for the audit is important to both consumers and producers. Positive results include improved animal well-being on farms, continued protection of the safe food supply, and market access that helps sustain independent swine producers and contribute to local rural economies.

Key Items of Evaluation

- Food safety and antibiotic resistance are issues increasingly important to livestock producers and consumers. More than 1100 livestock producers, veterinarians and feed distributors in Iowa participated in our workshops on the new animal antibiotic use regulations, judicious use of antibiotics in animal production and record keeping of medication use. They manage or impact more than 4 million animals. Evaluations showed 91% plan to improve communication about feed/antibiotic use, 81% plan to be more judicious in usage of antibiotics, and 83% plan to improve on-farm record-keeping of antibiotic usage.
- We responded in short notice to the emergency poultry disease outbreak in Iowa (HPAI, 2015). We met with poultry growers from 58 premises, in a region heavily impacted by the disease outbreak, to develop, improve, or make final adjustments to the USDA-APHIS work and financial plans. Their assistance helped producers move more quickly through the process, mitigated financial loss by reducing the time to return to production, and alleviated emotional stress associated with flock loss and loss of income.
- Ranking fourth in the nation on number of cattle on feed, a financially sound beef industry contributes to Iowa's economic viability. The Extension Beef Team developed and delivered a set of materials (Feedlot Manual, YouTube videos, online financial calculator, and 11 workshops state-wide) to assist Iowa beef producers' financial decision-making. End-of-workshop showed 54% of participants increased their knowledge of financial risk in their operations, 60% increased their knowledge on how facility type impacts weather effects on cattle performance, and 40% increased their understanding of how much performance would be impacted by weather.
- Iowa has approximately 18,000 farms under 50 acres. To provide outreach to this under-served audience, new learning opportunities were developed and delivered: the Iowa Small Farms Conference and an online Acreage Living Newsletter. Thirty-two percent of respondents to a post-conference survey stated intention to make changes based on conference information, and 56% of newsletter readership indicated they were researching a topic further based on newsletter information.
- Food security across Iowa is a growing problem. Iowa's SNAP-Ed Program collaborated with our Master Gardener program to address the growing problem of the lack of health and well-being among low-income households that rely on food pantries. Training and mini-grants enhanced connections between Master Gardeners and food pantries resulting in 58,000 pounds of produce grown and delivered to local food pantries.
- At the Iowa Correctional Institution for Women, we worked with prison staff to train

inmates how to farm and raise their own food for personal health and financial security and as a career option which can help prevent them from reoffending. Inmates learned planning, planting, maintaining, and harvesting a vegetable garden. The garden crew was able to grow over 8,000 lbs. of vegetables that supplied the prison dining services. Inmates gained skills to enter living wage jobs in the landscape/farming sector upon release from prison.

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
503	Quality Maintenance in Storing and Marketing Food Products	10%		9%	
703	Nutrition Education and Behavior	40%		32%	
704	Nutrition and Hunger in the Population	15%		0%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	5%		2%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		57%	
723	Hazards to Human Health and Safety	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.9	0.0	3.0	0.0
Actual Paid	8.4	0.0	5.9	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
790820	0	880162	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
790820	0	880162	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
868106	0	5970876	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conducted research on factors that influence child and adolescent obesity.
- Conducted research regarding fresh produce to ascertain best methods for determining freshness and best produce sanitizers to use in food production settings, and to develop food safety interventions; shared findings with industry professionals.
 - Conducted meetings, ServSafe® workshops, food safety certification, Hazard Analysis Critical Control Point (HACCP) implementation, Good Agricultural Practices (GAP) preparation, food safety training for volunteers, and childcare provider training.
 - Developed educational materials, resources and curriculum including web based tools and Extension publications.
 - Provided fundamental food safety training for volunteer staffed events, line level employees, school nutrition professionals, and childcare providers, and technical assistance related to application of food safety principles.
 - Provided nutrition and food resource management education through Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program Education (SNAP-Ed) programs.
 - Promoted access to healthy food at food pantries.
 - Facilitated community advocacy.

Faculty participated in relevant multi-state research committees NC1023, NC1194, NC2172, NE1439, NE1443, S294, S1056, W3002, W3003, W3045 and W3150.

2. Brief description of the target audience

- School-aged youth, childcare providers, school staff, and adult mentors of youth.
- Iowans in the workforce, participating in food assistance programming and community health outreach programs.
 - Food growers, foodservice management and staff in commercial and noncommercial operations, consumers, and food stand volunteers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	82720	1023493	843	9000

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

Patent Applications Submitted

Year: 2016
 Actual: 3

Patents listed

Materials and Methods for Production of Bi-Functional Fatty Acids in Recombinant Bacteria. Nikolau et al. Filed 11/30/15.

Method of making Fatty Acid N-Acylalkanolamines. Wang et. al. Patent #9,221,747 issued 12/29/15.

Peptide Domains that Bind Small Molecules of Industrial Significance. Rao. Patent #9,447,150 issued 9/20/2016.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	88

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

2016 9843

Output #2

Output Measure

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

Year	Actual
2016	3523

Output #3

Output Measure

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

Year	Actual
2016	369876

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
2016	150

Output #5

Output Measure

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

Year	Actual
2016	522939

Output #6

Output Measure

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

Year	Actual
2016	4120

Output #7

Output Measure

- Number of Iowans receiving food safety certification.

Year	Actual
2016	1896

Output #8

Output Measure

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

Year	Actual
2016	22717

Output #9

Output Measure

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

Year	Actual
2016	96217

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 milk.
2	Percent of youth participants reporting increased knowledge/intake of fruit.
3	Percent of youth participants reporting increased knowledge/intake of vegetables.
4	Percent of youth participants reporting increased physical activity.
5	Percent of childcare training participants reporting preparedness to apply or teach health promoting dietary behaviors.
6	Percent of adults reporting increased fruit and vegetable intakes.
7	Percent of adults reporting increasing minutes of physical activity.
8	Percent of adult EFNEP/SNAP-Ed graduates who made a positive change in food resource management skills such as not running out of food.
9	Number of people receiving food safety certification.
10	Percent of adults reporting increased knowledge of safe home food preservation techniques.
11	Percent of adult EFNEP/SNAP-Ed graduates with a positive change in food safety practices.
12	Number of food handlers receiving food safety training and education in safe food practices.
13	Pounds of produce entering Iowa food pantry system.
14	Number of dietary professionals that understand modern dairy practices as they pertain to animal health, comfort, and sustainability, as well as milk and dairy product quality and safety.
15	Number of consumers that understand modern dairy practices as they pertain to animal health, comfort, and sustainability, as well as milk and dairy product quality and safety.
16	Percent of food industry professionals who change behaviors in favor of better food safety practices, after knowledge of defects
17	Identification of at least one surrogate microorganism that can be used in a food production setting to determine if a food safety intervention has been effective.

18	Number of produce industry companies receiving new research results regarding best methods to determine freshness of fresh-cut produce and best produce sanitizers to use to improve quality and safety.
19	Increased knowledge of antecedents of child and adolescent obesity

Outcome #1

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	22

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 low-income families. 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 child care settings.

Results

Knowledge is measured in the youngest program participants (grades K-2) and 20% increased knowledge of which foods are fruits. Self-reported behavior is measured with older program participants (grades 3-5) and 22% 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. We are working with national EFNEP partners to identify a better tool.

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 youth participants reporting increased knowledge/intake of vegetables.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	32

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.

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 low-income families. 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 child care settings.

Results

Knowledge is measured in the youngest program participants (grades K-2) and 27% increased knowledge of which foods are vegetables. Self-reported behavior is measured with older program participants (grades 3-5) and 32% 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. We are working with national EFNEP partners to identify a better tool.

4. Associated Knowledge Areas

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

Outcome #4

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
2016	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The 2015 Dietary Guidelines for Americans recommend sixty minutes of active play every day for children. The 2014 Iowa Youth Survey data show that just 28% 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, 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 low-income families. 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 child care 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

Eighteen percent of Kids in the Kitchen participants in grades 3-5 reported increased physical activity. It is worth noting that 80% of children indicated they were active on most days or every day at program entry. This ceiling effect limits our ability to show change using the required youth EFNEP tool. We are 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 #5

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
2016	72

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 has been provided to 1554 childcare providers in Iowa.

Results

72% 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 #6

1. Outcome Measures

Percent of adults reporting increased fruit and vegetable intakes.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	50

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 cup of fruits per day and 1.6 cups of vegetables -- well below the DGA recommendation. Additionally, more than 25% of program participants ate no fruit at program entry.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of eight to ten nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age ten 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. Lessons three through seven 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, 49% of participants increased their consumption of fruits and 50% vegetables. On average, combined fruit and vegetable consumption among EFNEP and SNAP-Ed graduates increased by 0.7 cups.

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

Percent of adults reporting increasing minutes of physical activity.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	46

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 five 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, 14.1%, just meet aerobic and strength physical activity recommendations.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of eight to ten nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age ten 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 1, Get Moving, focuses on physical activity.

Results

Following participation in at least eight lessons, 46% of participants increased the amount of physical activity in which they regularly participate. In addition, by the completion of the program, 76% 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 #8

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
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	87

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 lowans are food insecure.

What has been done

EFNEP and SNAP-Ed direct education in Iowa is a series of eight to ten nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age ten 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, 87% 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 #9

1. Outcome Measures

Number of people receiving food safety certification.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1896

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is estimated 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

Over 2,400 Iowans (n = 2,442) participated in an 8-hour workshop about safe food handling practices.

Results

Of the 2,442 who participated in the 8-hour certification course workshop, 78% (n = 1,896) 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

723 Naturally Occurring Toxins
Hazards to Human Health and Safety

Outcome #10

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
2016	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Interest in home food preservation has increased due to the local food movement and 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 4,120 people who received some food preservation assistance, 617 adults participated in food preservation education programming. Of these 617 adults, 98 completed the statewide comprehensive food preservation program and 519 attended a general food preservation class. Additionally, 3,503 individuals called with food preservation questions.

Results

Of those who took part in the online food preservation lessons, there was an increase in those reporting "high to very high" post knowledge about canning processing times, foodborne illness (e.g. causes, high risk foods), safe food handling practices, 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 Naturally Occurring Toxins

723 Hazards to Human Health and Safety

Outcome #11

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
2016	66

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 eight to ten nutrition lessons taught by paraprofessional nutrition educators to families with low income and children age ten 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 19.5% of program participants demonstrated acceptable food safety practices (i.e. thawing and storing foods properly). Following participation in at least eight lessons 54% of participants demonstrated acceptable food safety practices (i.e. thawing and storing foods properly) at exit. A majority of program participants improved food safety practices from entry to exit with 66% moving closer to ideal practices.

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
723	Hazards to Human Health and Safety

Outcome #12

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	10583

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is estimated 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 production and service with knowledge about risks can help in reducing incidents of foodborne illness by leading to better practices.

What has been done

Over 10,000 (n= 10,583) participated in food safety sessions related to produce safety, general food safety, and safe handling of food when working in retail outlets and food stands.

Results

Participants indicate food safety training prepares them to minimize risks of food borne illness in their work settings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
703	Nutrition Education and Behavior

- 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

Pounds of produce entering Iowa food pantry system.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	68700

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over 12% of Iowa's population is food insecure. According to a 2014 Feeding America study conducted with Iowa food pantry clients, the number one item desired by pantry clients that is not available at pantries is 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

Iowa State University SNAP-Ed and Master Gardener programs have created a collaborative project to improve access to fruits and vegetables in Iowa's food pantries. Master gardeners all over the state received training on working with food pantries and food safety in donation gardens. They then had the opportunity to receive mini-grants to fund donation gardens in partnership with their local food pantries.

Results

Ninety Master Gardener volunteers participated in the first year of the project (2016) and they donated over 68,000 pounds of produce which equates to more than 204,000 servings of fruits and vegetables.

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

Outcome #14

1. Outcome Measures

Number of dietary professionals that understand modern dairy practices as they pertain to animal health, comfort, and sustainability, as well as milk and dairy product quality and safety.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	755

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

ISU Extension and Outreach and Midwest Dairy Association conducted four all-day dairy retail academies for grocery store dairy managers and in-store dietitians/health professionals (n = 3), and culinary arts college instructors and chefs (n = 1). Presentation topics included: practices, sustainability, and animal health and well-being. On-farm and milk processing plant tours were also conducted. Pre- and post-tests measured attendee understanding of dairy facts, topic knowledge, and personal satisfaction. In addition, two national webinars (one for practicing registered dietitians and one for Iowa State's registered dietitian intern program) were conducted; 140 attended the programs and 430 have viewed the archived materials.

Results

- * 100% ranked this as a highly effective educational event.
- * 100% ranked this as a highly credible, understandable source of dairy practices and information.
- * 98% increased post workshop test scores compared to pre-workshops scores, resulting in an 87% increase in knowledge.

- * Grocery store dairy managers rated this as the most highly effective educational training of their careers and had greater understanding of dairy practices and sustainability.
- * 100% grocery store dairy managers and dieticians stated they have greater understanding of dairy practices and dairy sustainability.
- * 100% grocery store dairy managers and dieticians stated they would use this information with their peers and clients.
- * Grocery store dairy managers, who are the sole person in the store to respond to dairy issues, estimated their individual interactions be more than 500 customers/year.
- * In-store dieticians estimated they have more than 400+ individual clients and contacts/year.
- * >95% stated extreme comfort in answering questions regarding dairy practices and sustainability

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
723	Hazards to Human Health and Safety

Outcome #15

1. Outcome Measures

Number of consumers that understand modern dairy practices as they pertain to animal health, comfort, and sustainability, as well as milk and dairy product quality and safety.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	6765

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A large percentage of the U.S. population lives in an urban or suburban environment and are most often disconnected from agriculture and food production. At the same time, there is increasing interest and concern in the general population about food safety, quality, and

sustainability. While many consumers exercise trust in the dairy and other food systems, a segment of anxious, but uninformed, consumers appear to readily accept viewpoints of anti-livestock/anti-agriculture that are negative about animal care, environmental stewardship, and safety/quality of dairy products.

What has been done

The ISU Extension and Outreach Dairy Team and partners developed and conducted 36 educational programs addressing on-farm practices and sustainability of dairy and agriculture, and dairy product quality and safety. These included the Iowa Dairy Story for 4th and 5th grade students (14 events, n = 885), Gilbert 1st grade students and teachers (145), agricultural insurance agents (75), Northcrest Community Retirement Community (35), 13 farm visits with domestic or foreign visitors (175), and the first virtual reality dairy tour with 1st grader students from Iowa Falls/Alden (120 students and teachers). Sponsored by Midwest Dairy Association, the second College Dairy Day event, including on-farm dairy modules and tours, was taught by Extension faculty and Iowa State dairy science undergraduate students (185). Three June Dairy Month events and programs were conducted in northeast, northwest, and central Iowa (n = 4700).

Results

A total of 6765 participants were involved in all events with 4700, mostly non-ag families and young children, attending the three June Dairy Month programs. Three hundred and ninety-seven June Dairy Month post-event surveys were completed.

- * 99% rated events as very educational (88% as excellent).
- * Prior to event, 71% had a positive (58% extremely positive) opinion and trust in dairy farms.
- * Post event, 99% believed dairies provided the best care and handling of animals.
- * Post event, 98% believed dairies are protective of the environment and excel at environmental stewardship.
- * Post workshop, 99% stated dairies provide extremely safe and wholesome milk and dairy products.
- * 100% supported growth of the dairy industry in Iowa.
- * Post workshop, 99+% stated modern dairies and dairy practices were impressive and they had extreme confidence and trust in dairy farms and the dairy industry. Participant's opinion of modern dairies following the event was positively and significantly increased.
- * 68% of attendees stated they consume the recommended three servings of dairy a day while 89% ate less than two servings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #16

1. Outcome Measures

Percent of food industry professionals who change behaviors in favor of better food safety practices, after knowledge of defects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	95

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fruit, vegetables, and nuts attribute to 46% of all the foodborne outbreaks in the U.S. each year. Even with current food safety interventions such as produce sanitizers, good agricultural practices, and employee training, there is continuously recalls and outbreaks with fresh produce that kills, hospitalizes, and sickens hundreds of people. There is a continuous need to develop food safety interventions that will control for microbial contamination.

What has been done

We evaluated 8 different produce sanitizers as potential for killing Escherichia coli O157:H7, Salmonella spp., and Listeria monocytogenes. We developed four different detection platforms for Salmonella spp and new methods to better find the microbes within the environment. We did on-farm observational research and trainings to over 300 growers. Findings were published in three journal articles and four extension publications. All of this research has been presented at conferences through the U.S. and the world. It is estimated that over 10,000 food industry, academics, and government agencies have been exposed to this research.

Results

Changes in behavior after knowledge of defects has been measured and of those surveyed (n=199) there have been 95% that have indicated that they will change their behavior in favor of a better food safety practice. These include adoption of new produce sanitizers, training, and technology.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #17

1. Outcome Measures

Identification of at least one surrogate microorganism that can be used in a food production setting to determine if a food safety intervention has been effective.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Human pathogens cannot be utilized in a food production setting to determine if a food safety intervention is effective. Therefore, the use of surrogate microorganisms that act like the human pathogens are critical for the fresh-cut industry to have an accurate model. The selection and evaluation of surrogate microorganism is an area that is under researched in the microbiology field.

What has been done

Conducted research to identify potential surrogate microorganisms that can be used within a produce field setting and in a fresh-cut processing setting.

Results

Identified 5 strains that can be utilized for microbial risk assessment that mimic the attributes of Escherichia coli O157:H7. These strains have been cited in 12 peer-reviewed journal articles as being used in other food safety research. With so few of options available, this is a major contribution to the field of food safety.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #18

1. Outcome Measures

Number of produce industry companies receiving new research results regarding best methods to determine freshness of fresh-cut produce and best produce sanitizers to use to improve quality and safety.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	10000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With over 230 farmers markets and 150 registered vegetable growers in Iowa, growers of fruits and vegetables are in need of new food safety intervention strategies and education to ensure the safety of their products. Quality and shelf life of fresh-cut are a great concern to all produce growers as shelf life is an indicator of the profits lost due to food waste. Quality attributes such as flavor, juiciness, texture, and color contribute to a consumer's desire to purchase the fruit; changes in firmness, color, and sensory attributes are the determination factor for the end of shelf life. It is estimated that loss of fresh fruit at retail level can range from 10-25 percent.

What has been done

Research was conducted to determine the best methods to determine flavor and color parameters in herbs and fresh cut produce and to identify the best produce sanitizers for improving the quality of melons, peppers, leafy greens, and grapes (over 10 different products). Shelf life studies were conducted on many different fruits and vegetables.

Results

Recommendations to the fresh-cut industry on best methods for determining flavor, aroma, and color attributes have been presented to the produce industry (10,000 companies) through United Fresh, a fresh produce industry association. Adoption rates are unknown.

As a result of this research, peer-reviewed journal articles, book chapters, and conference posters and oral presentations have occurred. It is estimated that over 10,000 food industry personnel have been exposed to this research. This research has been utilized to change industry practices and has introduced new produce sanitizers into the fresh-cut industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
723	Hazards to Human Health and Safety

Outcome #19

1. Outcome Measures

Increased knowledge of antecedents of child and adolescent obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Childhood obesity is now considered a national and global epidemic. Approximately 40% of America's youth (6 to 19 years old) are overweight or obese (making it the most prevalent medical condition among youth). While genetic and biological factors have consistently been shown to be central to whether or not a child is obese, environmental factors such as a child's physical surroundings or built environment, low levels of physical activity, and parental influence matter as well.

What has been done

Guided by a family stress framework as well as Bronfenbrenner's bioecological theory of human development we examined two environmental factors that are hypothesized to influence childhood obesity -- exposure to toxic stress and food insecurity. We examined the relationship between toxic stress and child and adolescent obesity, and we examined if food insecurity exacerbates the relationship between toxic stress exposure and child and adolescent obesity over time, particularly high-risk populations who are at greater risk for experiencing toxic stress and food insecurity.

Results

In one study, we found that for female children, harsh parenting (HP) and food insecurity (FI) predicted being obese/overweight in adulthood, but these same associations were not found for male children. In addition, female children who experienced high levels of both harsh parenting

and food insecurity at age 13 were more likely to be overweight/obese at age 23 than those who had low levels of harsh parenting, regardless of food insecurity level. Another study showed that females who experienced high levels of FI and HP in adolescence had higher odds of overweight/obese at 23 years in comparison to males. HP, in combination with FI in adolescence, predicted overweight/obese for females in emerging adulthood, but not males. Our research increased knowledge regarding the antecedents of child and adolescent obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

This state plan of work has identified and implemented priority programming based on: timeliness, relevance, uniqueness (services not offered by other organizations) and impact. In addition, sequential programming was prioritized based on the ability to demonstrate impact. To evaluate priority programs (i.e. childcare training), online surveys are capturing evaluation/impact data. Childcare training results suggest more than 70% of participants felt prepared to apply and the teach health promoting dietary behaviors they learned.

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. Federal and state legislation continues to impact appropriations and policy for nutrition and health programming initiatives. In this state, a grocery store chain employs registered dietitians in stores throughout the state (currently > 100). This trend has created competition for programming in rural communities that had been traditionally served by ISU Extension and Outreach staff. Healthcare reform will also modify the landscape for programming in this plan of work; additional opportunities in preventive health care may be available for ISU Extension and Outreach.

Extension in this state continues to experience changes in client preferences for program delivery, which fuels the demand for more programming via technology. In response, ISU Extension and Outreach designed several websites and social media pages. Educational materials are available in online format, such as streaming videos to meet needs of lowans. We are now monitoring the use of these pages through "unique visitors" rather than page "hits." Several of the education materials are available on the Spend Smart. Eat Smart., Food Safety, and Nutrition and Health websites. This state is examining novel strategies to

capture impact of technology-enhanced indirect delivery methods. The Iowa demographic continues to change and challenges programming efforts that are sensitive to diverse cultures. 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. Further, Iowa's adoption of Food Code 2011 Supplement requires one employee at each foodservice establishment to have certification in food safety through an approved program (i.e., ServSafe®). Economic challenges and increasing numbers of New Iowans led to investigation by food entrepreneurs of ways to grow food based businesses and our efforts to offer limited text and Spanish language educational materials. We offered 7 Spanish taught ServSafe® classes this past year reaching 56 participants.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Through high pass rates (78%) on the national ServSafe® certification exam and food preservation knowledge surveys we know our food safety programs have led to increases in knowledge, with the ultimate goal of changes in behavior. Increases in numbers of Iowans participating in food safety programming, beyond our targets, indicates there is considerable interest in improving safe food handling practices at all links of the food chain.

EFNEP and SNAP-Ed participants showed high rates of behavior change this year with the majority 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.

Participants of the all-day dairy retail academies for grocery store dairy managers and in-store dietitians (3) and culinary arts college instructors and restaurant chefs (1) completed 244 surveys:

- 100% ranked as a highly effective educational event.
- 100% ranked as a highly credible, understandable source of dairy practices and information.
- 98% increased post-workshop scores compared to pre-workshops scores, showing an 87% increase in knowledge.
 - Grocery store dairy managers rated this as most highly effective educational training of their careers and had greater understanding of dairy practices and sustainability.
 - 100% grocery store dairy managers and dietitians stated greater understanding of dairy practices and dairy sustainability.
 - 100% grocery store dairy managers and dietitians stated they would use this information with their peers and clients.
 - Grocery store dairy managers, who are the sole person in the store to respond to dairy issues, estimated their individual interactions be more than 500 customers/year.
 - In-store dietitians estimated they have more than 400 individual clients and contacts/year.
 - > 95% stated extreme comfort in answering questions regarding dairy practices and sustainability

A total of 6765 participants were involved in all events with 4700, mostly non-ag families and young children, attending the three June Dairy Month programs. Three hundred and ninety-seven June Dairy Month post-event surveys were completed.

- 99% rated events as very educational (88% as excellent).
- Prior to event, 71% had a positive (58% extremely positive) opinion and trust in dairy farms
- Post event, 99% believed dairies provided the best care and handling of animals.
- Post event, 98% believed dairies are protective of the environment and excel at environmental stewardship.
 - Post workshop, 99% stated dairies provide extremely safe and wholesome milk and dairy products.
 - 100% supported growth of the dairy industry in Iowa.
 - Post workshop, 99+% stated modern dairies and dairy practices were impressive and had extreme confidence and trust in dairy farms and the dairy industry. Participant's opinion of modern dairies following the event was positively and significantly increased.
 - 68% of attendees stated they consume the recommended three servings of dairy/day while 89% ate less than two servings.

Key Items of Evaluation

Childcare training participant survey, collected post-training and entered into an online system for statewide analysis. Numbers participating in food safety certification programs, number and percent of those that achieve food safety certification, and 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.

Dairy retail academies for grocery store staff and dairy tours/workshops for consumers showed that 99+% participants stated that modern dairies and dairy practices were impressive and they have extreme confidence and trust in dairy farms, the dairy industry, and product quality and safety. One hundred percent of grocery store dairy managers, in-store dieticians, and dietician webinar stated they would use the materials and education with their clients (400-500 persons/year and less than more than 92% felt very comfortable in presenting dairy information and practices. Overall, participants have a greater understanding and appreciation for modern dairy farms and their practices, role in sustainability, and provision of 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%		5%	
102	Soil, Plant, Water, Nutrient Relationships	11%		20%	
111	Conservation and Efficient Use of Water	5%		0%	
112	Watershed Protection and Management	6%		6%	
121	Management of Range Resources	0%		1%	
123	Management and Sustainability of Forest Resources	5%		0%	
125	Agroforestry	5%		0%	
131	Alternative Uses of Land	6%		1%	
132	Weather and Climate	5%		1%	
133	Pollution Prevention and Mitigation	6%		1%	
134	Outdoor Recreation	0%		1%	
135	Aquatic and Terrestrial Wildlife	5%		40%	
136	Conservation of Biological Diversity	5%		10%	
141	Air Resource Protection and Management	5%		4%	
403	Waste Disposal, Recycling, and Reuse	5%		4%	
405	Drainage and Irrigation Systems and Facilities	10%		1%	
605	Natural Resource and Environmental Economics	10%		5%	
608	Community Resource Planning and Development	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	11.8	0.0	6.8	0.0

Actual Paid	14.6	0.0	9.7	0.0
Actual Volunteer	29.0	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
1810739	0	1417780	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1810739	0	1417780	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1774781	0	6916371	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The following basic to applied research activities allowed 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).
 - Identified site specific strategies and facilitated the implementation of these strategies to improve air quality and address related concerns such as risks of domestic-wildlife disease transmission, particularly with respect to siting and operations of confined-animal feeding operations and neighbor-to-neighbor relationships.
 - Researched ways to conserve the use of energy inputs used in the production of food, feed, fiber and biofuels with a particular view towards carbon reduction.

The following extension/outreach activities allowed for attainment of the program goals.

- Used appropriate curriculum for targeted groups, publications, and web-based tools for decision making.
 - 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 policymakers.
 - Produced, updated and revised handbooks, newsletters, and publications.
 - Presented workshops and conducted field days, farm/field visits, and web-based sessions.
 - Developed strategies and programs to increase community (citizen) involvement, especially related to private and public natural resources.
 - Developed and executed educational programs about indices and diagnostic tools (e.g. P Index) that

can be used to improve nutrient management.

- Developed and executed educational programs on methods to conserve and produce biorenewable energy.

Faculty participated in relevant multi-state research committees NC0213, NC0507, NC1034, NC1173, NC1178, NC1181, NC1182, NC1190, NC1195, NC1198, NE1438, NE1442, S1032, S1053, S1063, S1065, W0506, W2006, W3004, W3045, W3128, W3133, AND W3188.

2. Brief description of the target audience

Stakeholders to be 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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	97893	1169858	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 1

Patents listed

Biodegradable Fertilizer. Grewell et. al. Filed 10/12/15. Also applies to the Sustainable and Renewable Energy Program.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	304

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
2016	93871

Output #2

Output Measure

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

Year	Actual
2016	1252171

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 and conservation practices was 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 impacted by improving crop performance through proper drainage.
4	Percent of USDA Natural Resources Conservation Service (NRCS) & Soil & Water Conservation District (SWCD) staff who report improved ability to measure pasture condition scores and monitor the effectiveness of grazing management systems.
5	Increased knowledge that contributes to the development of resilient urban landscapes, suitable for the Midwest, and/or management practices that reduce their environmental impact.
6	Increased knowledge of best management conservation practices, crops, and cropping systems that control soil erosion, minimize sediment transport, and reduce nutrient export
7	Increased knowledge of how to conserve, manage and maintain the health of wildlife populations.

Outcome #1

1. Outcome Measures

Number of acres where the adoption of BMPs and conservation practices was implemented.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	95159

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Soil erosion and nutrient loss are major problems facing Iowa farmers as higher land prices and land rents increase the pressure to maximize production. Eroded sediment and nutrients are 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 leaving Iowa.

What has been done

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

Results

In 2016, farmers attending Iowa Learning Farm field days reported the following conservation practices:

- increased use of surface residue management on 54,425 acres
- fall-seeded cover crops on 40,257 acres
- seeded 477 acres of prairie strips within row crop fields

42 participants in RUSLE2 workshops reported they will use the training to implement soil erosion controls and for making water quality improvements on 90,000 acres.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

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
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	5625

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. 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 cost while optimizing crop production and protecting the environment.

B. Farm economists from Iowa State University and the University of Illinois estimated the cost of production for corn and soybean crops in 2016 would be about \$80 per acre higher than projected revenue. Farmers either needed higher grain prices in 2016 (which didn't happen) or they needed to reduce crop production costs which include: land rent, fertilizer, seed, machinery depreciation, and pesticides. Fertilizer tends to be the second or third largest cost in farming operations. In recent years, farmers have improved their timeliness of soil testing to determine nutrient content.

However, interpreting the soil tests results and understanding the research-based University recommendations to maximize profits still eludes many farmers and agricultural service providers.

What has been done

A. Iowa State University Extension and Outreach helps farmers manage manure by providing education in the manure certification program, developing manure management plans, and distributing news articles. Presented research results demonstrate how careful application of manure provides optimal crop nutrients and protects soil, water and air. The certification program also provides participants with a history of environmental spills so steps can be taken to prevent the same mistakes. The program was presented to over 2200 farmers by conducting 63 face-to-face meetings and additional DVD viewings.

B. In northeast Iowa, ISU Extension and Outreach provided program opportunities for clients to learn how to maximize economic returns to crop fertilizer expenses. Seven, two-hour workshops, which also emphasized manure nutrient use, were targeted toward dairy producers. Eight workshops were open to all clients. All events were small group, hands-on workshops using current soil test results and fertilizer prices. A worksheet, showing a step-by-step process for soil testing, interpretation, and fertilizer calculations, was provided. Additional extension publications were provided as well. An abbreviated one-hour version of the workshop was presented at seven meetings to reach a total of 264 farmer and agricultural service providers, and 24 NRCS staff.

Results

A. In follow-up surveys of the participants of the manure certification program, farmers reported on current practices and plans to reduce negative environmental impacts on over 150,000 acres. The results were:

- 22% of farmers reported using a nitrogen stabilizer to reduce nitrogen loss.
 - 40% of the farmers reported they were somewhat or very concerned about their equipment's ability to achieve lower manure application rates.
 - Over 95% of the farmers indicated the information would be useful to them in their operation.
- Iowa farmers are using the knowledge gained from manure applicator training along with available technology and equipment to optimize manure applications in protecting water, soil, and air.

B. End of meeting evaluations from the workshops (N = 209) indicated gains in knowledge of: 56% on understanding how to interpret soil tests; 67% on understanding how to interpret manure tests; 53% on how to determine crop nutrient requirements and fertilizer rates; and 51% on utilizing manure nutrients to meet crop nutrient requirements.

A follow-up survey, returned by 137 participants managing 55,900 acres, showed that on average their implemented changes reduced input costs by \$17 per acre, resulting in an estimated total value of \$950,300. Better farmer decisions on crop nutrient management improved their economic viability as well as contributed to sound environmental management.

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
133	Pollution Prevention and Mitigation

- 403 Waste Disposal, Recycling, and Reuse
- 405 Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

Number of acres impacted by improving crop performance through proper drainage.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	34000

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 bio-economy. 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 need training on drainage design concepts, economics of drainage, water quality and quantity management, and legal issues related to drainage.

What has been done

Iowa State University Extension and Outreach, in collaboration with University of Missouri Extension and Iowa USDA-NRCS, delivered a three-day Iowa Drainage School. The school trained participants on sub-surface drainage concepts, the design and layout of drainage systems, calculating line sizes and spacing using actual field data, making connections and setting up drainage control structures, and review of NRCS regulatory considerations for sub-surface drainage. In addition one-day workshops were held throughout the year for contractors and landowners.

Results

Of participants completing the evaluation, 100% rated the training as good and useful in making drainage decisions on over 34,000 acres annually. All participants, when asked what they learned from the school and how they will use it, indicated that the school helped them to better understand drainage design concepts and to make better decisions on drainage design and installation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
405	Drainage and Irrigation Systems and Facilities

Outcome #4

1. Outcome Measures

Percent of USDA Natural Resources Conservation Service (NRCS) & Soil & Water Conservation District (SWCD) staff who report improved ability to measure pasture condition scores and monitor the effectiveness of grazing management systems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	84

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa USDA-NRCS and ISU Extension and Outreach have partnered on many pasture management educational programs, but many county conservation staff report not being comfortable making recommendations to producers. Additional training on use of the tools used to measure pasture conditions and monitor the effectiveness of grazing management systems can increase their confidence and improve the quantity and quality of pasture recommendations they make.

What has been done

ISU Extension and Outreach contracted to provide two years training for NRCS and SWCD field staff on pasture management practices and the impact on soil conservation and water quality. The training focused on the advantages of grazing has on the soil ecosystem, basic grazing management practices, pasture metrics, addressing individual objectives, fencing and water options, subdivision designs, and animal care. The training provided training on the use of tools to measure pasture conditions and monitor the effects of grazing management systems.

Results

295 NRCS staff attended the first year training, and 187 attended the second year training. 84% of participants said this training improved their ability to measure pasture condition scores and

monitor the effectiveness of grazing management systems. The program emphasized the interaction between animals, plants and soil to protect and improve the environment, through the use of these tools.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources

Outcome #5

1. Outcome Measures

Increased knowledge that contributes to the development of resilient urban landscapes, suitable for the Midwest, and/or management practices that reduce their environmental impact.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Based on input from stake-holders in the state of Iowa, there is a need for increased understanding of the basic mechanisms that govern the environmental adaptation of horticultural plants to changing environment conditions.

What has been done

Cultivar/species trials were performed for turfgrasses (most of which are also polyploids), woody and herbaceous ornamentals and shade trees to determine critically needed information on horticultural performance, adaptation and sustainable management practices of these in Iowa and the Midwest.

Results

Our research findings enable stakeholders to select suitable species or cultivars for sustainable horticulture production. The commercial release of two novel Indiangrass plants promotes the use of native prairie species for landscaping. Early fall or late spring freezing accounts for major losses to horticulture crops. The identification of candidate genes that potentially play a role in recovery from freeze-thaw stress provides guidance to plant breeders in developing novel germplasm that are more resilient in response to climate changes. We also established a robust genome editing platform for switchgrass. Crops created with the novel CRISPR/Cas9 technology

could potentially bypass some of the regulatory issues concerning GMOs. Both protocols are broadly applicable to all polyploid grasses for rapid gene discovery.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
132	Weather and Climate
134	Outdoor Recreation

Outcome #6

1. Outcome Measures

Increased knowledge of best management conservation practices, crops, and cropping systems that control soil erosion, minimize sediment transport, and reduce nutrient export

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. Optimal nitrogen (N) fertilizer use is critical for profitable corn production and for minimizing risk of nitrate reaching surface and ground water systems.

B. There is an increasing demand by the livestock production systems for the use of corn stover in feeding and bedding needs. At the same time, society is demanding solutions to issues such as increasing levels of greenhouse gases in the atmosphere and water quality impairment due to sediment and nutrient enrichment. These issues can be impacted by crop biomass removal. However, the impacts of large-scale corn stover or other crop biomass removal on the soil resource, sustainability of crop production and environmental conservation are not well known.

What has been done

A. We conducted field research and documented that soil N is an important source of N used by corn, often more than from added N, and therefore greatly influences the amount of N fertilization needed for corn production. Crop rotation, corn following soybean compared to continuous corn, allows for less N application required for corn but the soybean crop does not provide adequate

biomass via crop residues to maintain soil N and C (organic matter) resources. Continuous corn, at optimal application rates, does maintain or increase soil organic matter, due to high yearly crop residue levels. While a rye cover crop is an important practice for reducing residual nitrate-N and loss in drainage water, that cover crop has no influence on optimal corn N rate recommendations. In addition, loss of N as nitrous oxide can occur in both corn and soybean crops, and may be increased within a rye cover crop system.

B. Began coordinated studies on Iowa farm fields to determine the short- and long-term impacts of different corn residue removal levels.

Results

A. These results highlight the complex soil-plant interactions within corn-based cropping systems, and how practices should be considered in concert when making changes to N input or production practice recommendations. The many site-years of N rate response trials, with different crop rotations and rye cover crop, provided the needed platform to study and increase our knowledge about soil N and C processes, evaluate soil N tests, and increase N response data, which we used to update information in the regional Corn Nitrogen Rate Calculator recommendation system. This improves the accuracy of this tool for producers and their advisors. The tool can be found online at <http://cnrc.agron.iastate.edu/>.

B. To date our studies have shown no significant effect of residue removal on corn yield and an occasional improvement in corn yield was observed with the residue removal, especially on wet and cold poorly-drained soils with continuous corn. However, there was a decline in soil organic carbon due to residue removal. Application of N fertilization greater than 150 lbs/acre did not significantly increase corn stover or root biomass, but it led to an increase in N₂O emissions. The results of this study help established level of residue removal that can sustain soil organic matter by removing approximately 25-30% of residue after harvest. These findings can be used by farmers and farm managers in managing their fields to sustain soil productivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation

Outcome #7

1. Outcome Measures

Increased knowledge of how to conserve, manage and maintain the health of wildlife populations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A. The health of wildlife populations is receiving increased attention in recent years for several reasons including an increased awareness of the involvement of wildlife in diseases affecting humans and domestic animals and recognition that disease can have important impacts on the conservation of wildlife.

B. 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.

What has been done

A. Genetic data were collected to reconstruct white-tailed deer population social structure and dispersal patterns to identify factors that likely influence the transmission and spatial spread of chronic wasting disease (CWD) across Iowa that will help managers with their disease surveillance and management planning. Acoustic monitoring data were collected to identify patterns of bat activity across Iowa and identify regions at greatest risk for suffering impacts of white nose syndrome which will help managers identify areas for greater monitoring as well as mitigation and recovery planning. Behavioral and pathology data on mountain goats were collected to identify symptoms of respiratory disease, document impacts of disease on behavior and survival, and characterize the likelihood of interspecific disease transmission between mountain goats and bighorn sheep which demonstrated to managers that mountain goats, like bighorn sheep, are negatively impacted by pneumonia which has implications for how to best manage both mountain goat and bighorn sheep populations. Avian influenza surveillance in nontraditional reservoirs (songbirds and rodents) was conducted to better understand the epidemiology of avian influenza as it relates to disease risk to poultry to help industry better manage avian influenza risk to poultry populations.

B. We investigated wildlife populations through detailed demographic and monitoring studies, as well as analysis of movement patterns.

Results

A. The results of this research are contributing new knowledge of factors affecting wildlife health and the transmission, distribution and impacts of disease. We developed new knowledge that can be used by wildlife managers in Iowa and elsewhere. Specifically, we a) identified factors likely to affect the local transmission and spatial spread of chronic wasting disease; b) identified bat populations likely to be impacted by white nose syndrome and wind energy development, (results will help both wildlife managers and the wind energy industry better mitigate potential negative impacts of wind energy development of wildlife); c) identified impacts of pneumonia on mountain goat behavior and survival as well as potential for disease transmission to bighorn sheep; and d) clarified the role of small birds and mammals in the transmission of avian influenza from waterfowl to poultry, to help industry better manage avian influenza risk to poultry populations.

B. Our research findings formed a basis for several outcomes that impacted target audiences. Our work had change in knowledge implications for the PI, research associate, graduate students, and undergraduate mentees in these areas: recommended changes in stocking practices for juvenile Kootenai River White Sturgeon that were adopted by the Recovery Team, recommended changes in water management through Libby Dam to benefit spawning Kootenai River White Sturgeon that is under consideration, and provided advice on management practices for the Mountain Plover in a plague-affected ecosystem. The group's work resulted in a change in action in these areas: involvement with Iowa Department of Natural Resources committees (Implementation Committee, Wildlife Working group, Wildlife Habitat Working Group, Bird sub-group) 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, recommended strategies for mitigating the loss of farmed wetlands in Iowa, recommendations for forest patch management in Puerto Rico to benefit breeding birds, and proposed changes to Iowa's waterfowl breeding surveys that are used to allocate federal funds for habitat restoration.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

A recent downturn in commodity prices coupled with increased land values and rental rates over the past 5-7 years has put an increasing economic pressure on Iowa farmers. This has reduced financial resources available for conservation work, including the planting of cover crops. These economic factors have placed an increased pressure on Iowa soil and water resources.

The last decade of high farm commodity prices has prompted producers and land owners to cultivate many acres of pasture land for crop production, resulting in fewer acres protected by perennial forages.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Data for measuring the impact of the ISU Extension and Outreach programs was gathered through end-of-meeting evaluations during manure applicator certification meetings and Iowa Learning Farm surveys conducted on month and 6-18 months following participation in field events. In the end-of-meeting survey of the manure applicator certification training, 959 participants returned surveys reporting that:

- 22% of farmers reported using a nitrogen stabilizer to reduce nitrogen loss.
- 40% of the farmers reported they are somewhat or very concerned about their equipment's ability to achieve lower manure application rates.

For 2016, farmers attending Iowa Learning Farm field days reported the following conservation practices:

- increased use of surface residue management on 54,425 acres
- reported fall seeded cover crops on 40,257 acres for 2016
- had seeded 477 acres of prairie strips within row crop fields

ISU Extension contracted to provide two years training for NRCS & SWCD field staff on pasture management practices and the impact on soil conservation and water quality. A total of 295 NRCS staff attended the first year training, and 187 attended the second year training.

- Evaluations indicated that 84% of participants said this training improved their ability to measure pasture condition scores and monitor the effectiveness of grazing management systems.
- Year one participants evaluated the relevance and effectiveness of the training to improve their knowledge and ability to recommend grazing management practices to their clients with a mean of 4.3 on a 1 to 5 scale where 1 was not effective and 5 was very effective. Participant comments included, "I just thought a pasture was a pasture, I did not know that so much went into this kind of conservation," and "this showed staff the complexity in pasture management." One said "the nutritional needs of livestock and benefits of diversity were something that we don't think about. It was covered well," and another said "they shared good background material so we can have a good discussion with producers." Year two focused on more advanced topics such as fencing and water system design, evaluating plant diversity and metrics to evaluate pasture management.
- In year 2, 93% of participants increased their knowledge of water systems, 89% improved their knowledge of fence layouts, and 92% improved their knowledge of grazing cover crops.

Key Items of Evaluation

Educational events by Iowa State University have resulted in an increased use of surface residue management on 54,425 acres and 40,257 acres of fall-seeded cover crops for 2016. Through education in manure applicator training, 40% of farmers report they would be interested in improving their equipment for lower manure application rates.

Combining the research and educational expertise of ISU Extension and Outreach staff with the environmental focus of the Natural Resources Conservation Service resulted in a high quality training program for conservation field staff to better understand the interactions between animal, plants and soils to maintain and improve conservation practices in grazing lands. It also focused conservation planning on the needs and environmental concerns of the individual farmers and their land. This should result in conservation plans and practices that are sustained over a longer period of time.

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%		25%	
111	Conservation and Efficient Use of Water	8%		0%	
125	Agroforestry	8%		0%	
131	Alternative Uses of Land	8%		0%	
136	Conservation of Biological Diversity	8%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		14%	
202	Plant Genetic Resources	0%		13%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		14%	
205	Plant Management Systems	5%		9%	
302	Nutrient Utilization in Animals	8%		0%	
402	Engineering Systems and Equipment	8%		13%	
403	Waste Disposal, Recycling, and Reuse	8%		4%	
404	Instrumentation and Control Systems	0%		2%	
511	New and Improved Non-Food Products and Processes	8%		4%	
601	Economics of Agricultural Production and Farm Management	8%		0%	
602	Business Management, Finance, and Taxation	8%		0%	
605	Natural Resource and Environmental Economics	7%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.1	0.0	3.3	0.0

Actual Paid	3.6	0.0	4.9	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
452685	0	784249	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
452685	0	784249	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
26035	0	2699713	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; developed agronomic practices to produce these feedstocks in sustainable ways to mitigate environmental risks; developed new harvesting, storing and transporting systems for these new feedstocks; and adopted new conversion processes that are more efficient, use less energy and water, and produce value-added coproducts. These technologies are being integrated into a complete system and the Iowa State BioCentury Research Farm will play a key role. Extension programming focused on advising farmers on biomass production, with a focus on the risks and benefits of crops as biofuels.

Faculty participated in relevant multi-state research committees NC0213, S1041, S1054, and W2006.

2. Brief description of the target audience

Efforts in this program focus on basic human needs for environmentally sustainable energy and consumer goods (e.g. building construction materials, plastics and adhesives), producers with more efficient crops and production systems, rural communities with new employment opportunities and economic development, processing companies with advanced conversion technologies, and all Iowans because of the need for inexpensive and environmentally acceptable forms of energy. Producers and landowners need to know the opportunities and risks associated with biomass production and harvest.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2462	567631	0	0

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

Patent Applications Submitted

Year: 2016

Actual: 2

Patents listed

Biodegradable Fertilizer. Grewell et. al. Filed 10/12/15. Also applies to the Natural Resources and Environmental Stewardship program.

Materials and Methods for Using an Acyl-acyl Carrier Protein Thioesterase and Mutants and Chimeras Thereof in Fatty Acid Synthesis. Nikolau et. al. Patent #9,399,768 issued 7/26/16. Also applies to the Food Security program.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	35

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
2016	1363

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	Number of acres planted in biomass crops (<i>Miscanthus x giganteus</i>) in Iowa
4	Number increasing awareness and knowledge of research, issues, and benchmarking data in the renewable fuels industry.
5	Development of improved crops and plant materials for use as feedstocks to produce biofuels and biobased products

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.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of acres planted in biomass crops (*Miscanthus x giganteus*) in Iowa

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Miscanthus x 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. x giganteus* could provide more cellulosic biomass than any other herbaceous crop analyzed. Further, perennial grasses like *M. x giganteus* hold soil, improve water quality, and provide other ecosystem services such as wildlife habitat. Using *M. x 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.

What has been done

Iowa State has been conducting agronomic research on *M. × giganteus* since 2009. Early promising results motivated the University of Iowa to adopt *M. × giganteus* as a new biomass fuel to cofire with coal in the university's power plant. Since 2013, more than 300 acres of *M. × giganteus* have been planted in Iowa and are now being used in test burns. Iowa State has established a collaborative field experiment to test the economic and environmental sustainability of *M. × giganteus* and identify best crop management practices. The Long-term Assessment of Miscanthus Productivity and Sustainability (LAMPS) project has an advisory board comprised of four *M. × giganteus* growers, three Iowa State specialists, one *M. × giganteus* industry employee and one University of Iowa power plant employee.

Results

More than 300 acres of *M. × giganteus* have been planted for commercial use in the University of Iowa power plant since 2013; 200 of those were planted in 2016. More than 11,000 people have accessed information on Iowa State's video series posted on YouTube and, since 2009, more than 2000 have participated in Iowa State programming. The LAMPS project found that nitrogen fertilizer only increases yields under certain conditions and reduces the quality of harvested biomass for combustion in the power plant. This is an important result because nitrogen is an economically and environmentally expensive input for crop production. Iowa State research has identified likely optimum nitrogen fertilizer rates and shared findings through four industry-focused newsletters in 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
205	Plant Management Systems

Outcome #4

1. Outcome Measures

Number increasing awareness and knowledge of research, issues, and benchmarking data in the renewable fuels industry.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	24000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A reliable source of unbiased information for the renewable fuels industry faced possible discontinuation due to staff retirements. Discontinuation of the AgMRC Renewable Fuel Monthly Report would have caused a decrease or gap in the information stream available to those interested in the issues, research, and policy matters related to the renewable fuels industry.

What has been done

A new partnership was formed between ISU Extension and Outreach, AgMRC, Iowa Grain Quality Initiative and Decision Innovation Systems, a private sector partner, to continue information dissemination to the targeted audience. A graduate student position was created with the focus on enhancing data gathering and charting.

Results

The improved partnership and staffing arrangements have created positive changes. In less than one year, access of the newsletter has increased. The newsletter open rate increased from 15% to 28% and the number of views to the website increased from an average of 35,000/month to 59,000/month. With this increased interest, the partnership will continue to provide renewable fuels research data and issues information to renewable fuels industry leaders and policy makers.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Development of improved crops and plant materials for use as feedstocks to produce biofuels and biobased products

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Biofuels have been suggested as a major contributor to the energy security of the United States, to the economic growth of Iowa and to the reduction of greenhouse gasses emission that contribute to climate change. Maize-based ethanol cannot supply the total biofuel demand and it has detrimental implications for food and feed supplies. Therefore, other sources need to be developed to efficiently produce ethanol in large scale, such as lignocellulosic feedstock and/or sucrose producing crops.

What has been done

We established a sorghum breeding program for biofuel production at Iowa State University. A total of 1344 hybrids were evaluated in three locations in Iowa. We also investigated the effects of certain candidate genes on plant height for biomass production. Fertility evaluation of 68 historical and modern cultivars and 37 exotic sweet sorghum lines were conducted over several growing seasons (2011-2015). Lines were classified as maintainers or restorers based on their reaction to A1 cytoplasm. Sterilization process of maintainer lines was initiated through a backcross process and restorer lines were used to create new populations and tested in hybrid combinations. We also screened germplasm for cold tolerance at germination and incorporation into high biomass parental lines.

Results

Our project generated knowledge to facilitate and speed up the improvement of sorghum germplasm for biofuel production adapted to the Midwest. Tall, highly productive sorghum materials were developed as lignocellulosic feedstocks with the capacity to germinate under cold conditions (10-15oC) and be grown in marginal land. The introduction of this crop in the Midwest rotation could diversify the agricultural production system in this region, improve sustainability and contribute to the emerging bioenergy industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For the project described in Outcome Target #2 (Number of individuals who increase their knowledge in production/harvesting systems related to biomass crops), work is on-going, and has not yet progressed to the level of state-wide educational programming. Therefore, a full report on this effort is not available.

At this early stage involving outreach to a small cohort (13 stakeholders), a notable change is the fact that Iowa now has progressed to having 800 acres in a biomass crop (Miscanthus).

Another early indicator of progress is that a major stakeholder in adopting biomass crops for fuel (University of Iowa) has committed to ceasing use of coal for fuel by 2025.

Key Items of Evaluation

Iowa has increased acreage in biomass crop plantings to 800 acres.

As a result of a public-private partnership, ISU Extension and Outreach are contributors to an effort that has expanded dissemination and access about renewable fuels research data and issues to renewable fuels industry leaders and policy makers.

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: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	10.3	0.0	0.0	0.0
Actual Paid	10.6	0.0	0.0	0.0
Actual Volunteer	195.0	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
957146	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
957146	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2229670	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Broadened all youths' short-term and long-term learning opportunities in the program priorities of healthy living (including childhood obesity), STEM (including food safety), citizenship and leadership, and

communication and the arts.

- Organized 4-H staffing structure based on the four program priorities and outreach to all Iowa children and youth.
- Continued to transition staff time from activity management to program design, delivery, and evaluation; community and volunteer capacity building; and narrowing the achievement gap of Iowa's underserved youth audiences.
 - Improved engagement with ISU colleges and faculty to increase youth program offerings, while reaching diverse children and youth using current research and educational design methodologies.
 - Strengthened statewide volunteer management infrastructure to reach diverse volunteer pools.
 - Improved volunteer training by developing modules deployed via 4-H staff, partners, families, children, youth, and volunteers.
 - Enhanced welcoming and inclusive communication and partnerships among 4-H staff, partners, families, children, youth, and volunteers.
 - Expanded ISU and community partnerships to leverage resources for improved access to 4-H educational programs.
 - Designed learning experiences and conduct training with 4-H staff, county/regional Extension youth staff, volunteers, ISU faculty, and community and state partners that contribute to cultural competency and the life skill outcomes of leadership, citizenship, communication, and learning in environments that meet youths' needs and create positive youth development.
 - Built state- and community-level capacity to ensure policies and educational opportunities are based on cultural competency and positive youth development principles and practices.
 - Trained staff, faculty, and volunteers on how to create positive youth development and culturally competent learning environments in after school programs, camps, clubs, events, school, and out-of-school settings.
 - Analyzed county enrollment and population trends and identify barriers that limit diverse youth enrollment, retention, and participation in after school, camp, club, special event, and school delivery modes.
 - Implemented multi-faceted marketing infrastructure to communicate positive youth development principles, practices, and programming successes via news releases, brochures, on-line training, webinars, etc. with 4-H staff, county/regional Extension youth staff, community partners, Iowa State University faculty, families, youth, and volunteers.
 - Partnered with state and national entities to collect and report youth development and achievement gap impact data.
 - Evaluated and/or researched positive impact of 4-H participation in the lives of young people and the communities in which youth live and learn.
 - Continued to strengthen Clover Kids curricula and research base, and continue efforts to reach underserved and underrepresented K-3rd grade audiences.

2. Brief description of the target audience

- ISUEO Youth Program Specialists
- County Extension youth and 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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	7102	61205	98645	15209

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	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
2016	30706

Output #2

Output Measure

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

Year	Actual
2016	28288

Output #3

Output Measure

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

Year	Actual
2016	42797

Output #4

Output Measure

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

Year	Actual
2016	143157

Output #5

Output Measure

- Number of 4-H livestock exhibitors certified in Food Safety and Quality Assurance (FSQA).

Year	Actual
2016	7071

Output #6

Output Measure

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

Year	Actual
2016	24725

Output #7

Output Measure

- Number of local 4-H partnerships initiated or strengthened.

Year	Actual
2016	6754

Output #8

Output Measure

- Number of unduplicated youth engaged in 4-H learning opportunities.

Year	Actual
2016	98645

Output #9

Output Measure

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

Year	Actual
2016	1743

Output #10

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
2016	90

Output #11

Output Measure

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

Year	Actual
2016	5972

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 percentage 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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	42

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Iowa now has the 12th highest adult obesity rate in the nation, according to The State of Obesity: Better Policies for a Healthier America, released September 2016. Iowa's adult obesity rate is currently 32.1 percent, up from 20.9 percent in 2000 and from 12.2 percent in 1990. The current obesity rating among 10 to 17 year-old Iowa youth is 13.6%. In an effort to prevent these percentages from increasing, additional healthy living education, recreational opportunities, and access to nutritious foods is necessary for children, youth, and their families.

What has been done

Approximately 250 teachers, 4-H staff, volunteers, and community partners led 4-H yoga workshops to enhance mental, physical, emotional, and social well-being among youth. Educators were trained in yoga and then delivered their own customized workshops to youth and families. It is estimated that 1,500 youth completed the yoga educational sessions. Another 250 underrepresented and underserved youth attended Culturally-based Leadership Accelerators in 2016. Youth learned about an outdoor environment; the farm-to-table food production process; gained a greater appreciation for honeybees and understand how they support our food production system; tasted and practiced preparing meals/snacks using healthy foods and new flavors; and learned about and practice yoga as well as forms of dance relevant to their culture.

Results

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 healthy living-identified logic model outcomes. A sample of 694 youth enrolled in 4-H healthy living educational programming completed the Healthy Living construct as part of a 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, 33% of youth indicated a 1-point increase and 9% 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 handle and prepare food to eat, 4) participating in physically active events, and 5) helping their family make healthy food choices and meals.

Reliability analysis of the 4-H Healthy Living construct as part of a self-assessment tool indicated that the individual questions within the construct represented the conceptual meaning of the given construct. "Before" indicators also were significantly different from "After" indicators. Further, statistical comparisons of "After" and "Before" responses (all respondents combined) using paired t-tests were conducted for the construct, as well as for the individual questions within the construct. The respondents reported statistically significant "After" scores than "Before" scores for the construct and all individual items except for: "Safely and carefully handle and prepare food to eat."

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
2016	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Providing a safe and healthy food supply has always been a key issue to the American consumer, but in recent years this issue has become even more important to consumers, wholesale distributors, restaurant chains, and foreign export markets. Details on treatments and/or medications given to animals, as well as how animals have been raised and treated throughout their lives has become front-page news. Consequently, livestock producers continue to improve management practices to ensure American citizens have the safest food supply in the world.

Recent reports indicate that 50 percent of antibiotics prescribed for people are not needed or are not optimally effective (Center for Disease Control, Sept. 2013). Livestock producers strive for the judicious use of antibiotics in animals and only use them when necessary. A recent recommendation from the FDA has asked that antibiotics used as growth promotants should be phased out which has been supported by the agriculture industry. Food distributors and restaurant chains are providing economic incentives to producers that fall within their set of guidelines. Whether producers decide to fit into these guidelines, a single food-borne illness or drug residue found in meat can cause severe damage to the U.S. Markets both economically and by harming the livestock industry's reputation. 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). Iowa's 4-H youth are the future livestock producers of this state and are needed to increase job growth and economic development. Each year, the meat industry spends over \$80 million in meat inspection costs. Much of this cost could be reduced at the producer level by educating youth on how to treat and handle their animals correctly.

What has been done

A comprehensive food safety and quality assurance curriculum program (FSQA) is conducted each year with 4-H'ers. Through the use of a variety of educational materials, including video tutorials to 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

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.

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
2016	47

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the Committee on Prospering in the Global Economy of the 21st Century's report *Rising above the Gathering Storm* (The National Academies Press, 2007), the United States faces a critical shortage of young people with the skills and training to meet 21st century workforce needs and make scientifically informed decisions. In 2008 a Congressional Research Service (CRS) report (Kuenzi) urged the immediate need for STEM-related workforce development. The Iowa Economic Development Authority reports Iowa's manufacturing sector contributes the largest share of state gross domestic product (GDP) of any major sector, with \$23 billion contributed in 2009. In order for Iowa youth to be successful in the 21st century, they must be prepared with the skills the workforce needs.

What has been done

Throughout the State of Iowa, the 4-H program offers STEM learning opportunities for youth to increase their STEM process skills and improve their positive attitudes toward STEM education and careers through workshops, school enrichment activities, STEM-themed camps, after school programs, and clubs as well as individual project work on STEM-related topics. Programming provided during these in- and out-of-school opportunities utilized national 4-H curriculum, such as National Youth Science Day Drone Discovery, Iowa State University and other Land Grant University resources such as C6 BioFarm and the Governor's Advisory Council STEM Initiative, and other available science education resources such as those available through NASA and NOAA.

Results

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 STEM-identified logic model outcomes. 689 youth enrolled in 4-H STEM programming, including a state science fair and summer camps, completed the Iowa 4-H 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 participating in 4-H. On average, 36.2% of youth indicated a 1-point increase, 9.9% indicated a 2-point increase, and .9% 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 that 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. Youth indicated that being involved in 4-H increased their STEM aspirations when asked how likely they would be to... 1) Attend a school or training program related to science, engineering, technology, or math after you graduate from high school; 2) Someday have a job related to science, engineering, technology, or math.

Reliability analysis of the 4-H STEM Assessment Constructs indicated that the individual questions within each of the three constructs of STEM Aspirations, STEM Attitudes, and Science Process Skills, represented the conceptual meaning of the given construct. All three "Before" constructs were significantly correlated with their corresponding "After" constructs. Further, statistical comparisons of "After" and "Before" responses (all respondents combined) using paired sample t-tests were conducted for each of the constructs, as well as for the individual questions within the constructs. For each construct and 14 individual items, the respondents reported statistically significant "After" scores than "Before" scores.

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
2016	59

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 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 Iowa counties offered a communication event program. Over 2000 4-H members participated in public speaking and performance events at the 2016 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

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 communication-identified logic model outcomes. 1315 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, 37.9% of youth indicated a 1-point increase, 20.9% 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.

Reliability analysis of the 2016 communication constructs as part of self-assessment tools indicated that the individual questions within each of the four respective constructs of citizenship, leadership, communication, and learning represented the conceptual meaning of the given construct. "Before" constructs were also significantly correlated with "After" constructs. 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. Youths reported statistically significant "After" scores than "Before" scores the Communication construct and all individual items.

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
2016	64

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2008, Iowa Governor Chet Culver signed Senate File 2216 into law, which required full implementation of the Iowa Core by all public and accredited nonpublic schools. (February 2009 Iowa Core Curriculum Report to the State Board (2009-02-11)) 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) standards had to focus on giving teachers time to teach and students to learn; and 3) standards had to maintain local flexibility and teacher judgment.

What has been done

In fall 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

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 learning-identified logic model outcomes. 1,178 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 participating in 4-H. On average, 40.4 of youth indicated a 1-point increase, 23.8% indicated a 2-point or greater increase in their learning practices after participating in 4-H.

Youth commonly 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 of the Iowa 4-H Citizenship, Leadership, Communication, and Learning Self-Assessment tool 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. 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 the Learning Construct and nearly all individual questions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Average percentage 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
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Campbell and Erbstein (2012) found that 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. Hennessey, Ball, & Moncheski (2013) articulate the value of community youth development through 4-H in their case study regarding community youth development's effects on building social capital. They found both youth and adults benefit from a community youth development approach to service learning. In addition, both community recognition and community capacity increased. From their study of a 4-H club in Lamar, MO, Hennessey, Ball, & Moncheski (2013) found that when a core team of 4-Hers participated in community service learning activities, the community's level of civic engagement increased. Individuals' involvement in the community positively impacts not just the participants, but also the larger community.

What has been done

3,775 youth enrolled in the 4-H Citizenship project; 1,274 youth and adults contributed 5,616 volunteer hours to improve their communities via the State 4-H Youth Conference and DuPont Pioneer Community Improvement grants. 33 4-H clubs leveraged \$8,864 in DuPont Pioneer Community Improvement grants into nearly \$128,430 in community improvement projects. Four 4-H members served as delegates to the National 4-H Conference; 76 4-Hers participated in the national Citizenship Washington Focus program. 13 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

Youth commonly indicated being involved in 4-H helped a young person strengthen citizenship practices such as... 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.

On average, 41.7% of youth indicated a 1-point increase, and 24.9% indicated a 2-point or greater increase in their citizenship practices after participating in 4-H.

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
2016	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to Wehmeyer, Agran, & Hughes (1998), youth leadership is part of the youth development process and supports youth in developing: (a) the ability to reflect upon his or her strengths and weaknesses; establish personal and occupational goals; and have the self-esteem, confidence, motivation, and ability to carry them out (including the capacity to develop support networks in order to fully participate in community life and effect positive social change); and (b) the competence to point or direct others on a course of action, influence individuals' opinions and behaviors, and serve as a role model. Evaluations of youth development programs have demonstrated that young people who participate in youth leadership and civic engagement activities consistently get the supports and opportunities needed for healthy youth development (Innovation Center for Community and Youth Development, 2003). 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

2,141 Iowa youth are enrolled in the 4-H Leadership project. More than 1,479 community and project clubs provide leadership experiences for members. 660 youth and 67 adults received leadership training during the Iowa 4-H Youth Conference; 45 youth and adults completed Youth-Adult Partnerships training; 19 4-H members represented Iowa at the National 4-H Congress. Forty-two high school youth provide leadership as members of the State 4-H Council, planning the 4-H Youth Conference and serving as ambassadors for the 4-H program. Approximately 120 youth had volunteer leadership positions with 4-H events during the 2016 Iowa State Fair.

Results

Youth commonly indicated being 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.

On average, 40.1% of youth indicated a 1-point increase, and 19.6% indicated a 2-point or greater increase in their leadership practices after participating in 4-H.

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-based programs and financial support of families... County staff often point to competition for youths' time and family resources as reasons why 4-H membership stays fairly consistent year-to-year. The state program has responded by providing information on the cost of our competitors and noting our strategic difference of focusing on positive youth development with research-based curricula and the experiential learning model. The state 4-H office also undertook an extensive fee review in summer/fall 2016 that continues into 2017.

Competition for volunteer time and fewer engaged volunteers... While Iowa 4-H has seen an increase in the number of trained volunteers from 2015 to 2016, the state office continues to work on strategies to recruit volunteers of color to serve underrepresented youth of color. At the time same, the state office has invested in a volunteer training specialist who has developed several online training modules for volunteers, using 4-H Online. The goal is to make training for volunteers as convenient and thorough as possible.

Competition for outside funding and partners... Like other governmental entities, funding is always a concern and competition for resources exists. The state office responded by naming a Director of Stakeholders and Partnerships to, in part, pursue outside funding, and continue partner recruitment.

Changes from 4-H National programmatic policies, priorities and funding... Aligning program outcomes with NIFA and national priorities remains a challenge. Iowa is committed to maintaining and improving a comprehensive 4-H Youth Development program, which emphasizes broader youth development and life skills, while NIFA priorities are typically more narrowly focused.

Funding allocations at state, county, ISU and ISU Extension and Outreach levels... Iowa 4-H undertook a systemic financial review in 2016 and made funding decisions based on

how best the state can support the field serving counties. Taking a conservative financial approach has put Iowa 4-H in a solid financial position in FY 16 and into FY 17.

Continued turnover at county Extension district youth staff levels... Iowa continues to experience about a 33 percent turnover in county youth staff. Persistent staffing fluctuations have presented challenges in implementation of new curricula, programs to address youth diversity, and implementation of innovative programs. While strides have been made in all areas, it is inconsistent across the state, due in part to turnover and vacant positions for several weeks or months.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Iowa's evaluation is based on a review of actions under its four program priority areas: STEM, Healthy Living, Citizenship and Leadership, and Communication and the Arts. In addition, Iowa has chosen 35 4-H Outcome Indicators from the National 4-H outcome 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. Iowa 4-H partners with ISU's Research Institute for Studies in Education (RISE), which annually analyzes the data Iowa 4-H collects. Several analyses were conducted. 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. Compared to before their participation in 4-H: For our youth...

- 69.5 percent said they can make a difference in their community through service.
- 65.4% said they can apply knowledge in ways that solve real life problems through service learning projects.
 - 63.8 percent said they will work on service projects to meet needs in their communities.
 - 68.8 percent said doing service projects will give them skills they can use in the future.
 - 63.3 percent said they are more willing to listen to other people's view whether they agree with them or not.
- 56.6 said they enjoy learning from people different from them.
- 56.4 enjoy working in a team.
- 57.97 said they liked working with and listening to others before making a decision.
- 53.59 said they learned to handle conflict respectfully
- 59.7 said they can lead a group in making a decision.
- 53 percent said they could treat everyone fairly and equally in leading a group.
- 63.1 percent they feel confident when speaking in front of a group.
- 51.9 percent said they can use good listening skills when others are talking
- 53.8 percent said they are willing to ask questions.
- 52.2 said they can use technology to express their ideas
- 60 percent said they can create products to share information
- 62.7 percent said they can create learning goals
- 60.9 percent can identify the strengths and weaknesses of different approaches or ideas.
- 61.7 percent said they can identify what is going well and what needs to change to achieve goals.

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 (FSQA) 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.