

2014 South Dakota State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The College of Agriculture & Biological Sciences at South Dakota State University is home to both SDSU Extension and the South Dakota Agricultural Experiment Station. The college is the largest at SDSU in terms of student enrollment, faculty/staff, and building space. Our college and SDSU's College of Education and Human Sciences work closely together to provide important programs in food science and research. Through many important partnerships, we are able to expand the boundaries of knowledge and enhance society.

SDSU Extension and the South Dakota Agricultural Experiment Station achieve their goals with researchers and state specialists located on the SDSU campus in Eastern South Dakota, eight regional centers operating across the state with field specialists, and six research field stations. Outreach is also achieved with three Federally Recognized Tribal Extension Program offices, and the West River Agricultural Center representing the Western part of South Dakota. 4-H Youth Development begins on campus with the South Dakota State 4-H Office and has 4-H field specialists in the regional centers and 4-H youth advisors in county owned offices. SDSU Extension's online teaching platform, iGrow, had nearly 600,000 users during this reporting period.

South Dakota State University uses the following Planned Programs in its Combined Research and Extension Annual Report of Accomplishments and Results. The Planned Programs are based on the USDA Knowledge Area Classification System.

Natural Resources and Environment

The research activities in this program are primarily supported by our Department of Natural Resource Management. Projects funded by Hatch include but are not limited to research studies in climate variability, crop impact from Canada geese, watershed management, soil productivity, bioenergy, wildlife habitat, carbon sequestration, pollution prevention, and range management. Activities being reported for SDSU Extension in this Planned Program include Grazing Schools, Concentrated Animal Feeding Operations, and Soils Management.

Plants and Their Systems

The research activities in this program are primarily supported by our Department of Plant Science and our Department of Biology and Microbiology. Hatch funded projects include but are not limited to studies in oilseed production, nodule development in soybeans, wheat genetics and genomics, perennial grasses for bioenergy, crop pests and diseases, grapevine mapping, and improved alfalfa production. Activities being reported for SDSU Extension in this Planned Program include Backyard Biodiversity, Pesticide Applicator Training, Master Gardeners, and Integrated Pest Management.

Animals and Their Systems

The research activities in this program are primarily supported by our Department of Animal Science, Department of Dairy Science and our Veterinary and Biomedical Sciences. Hatch funded projects include but are not limited to research studies in co-product feeds for sheep, genetic architecture of traits in beef cattle, milk production management for dairy cattle, vaccines for viral diseases, and reproductive efficiency in cattle. Activities being reported for SDSU Extension in this Planned Program include Growing South Dakota Beef, Calf Value Discovery, and Growing South Dakota Sheep.

Agricultural, Natural Resource, and Biological Engineering

The research activities in this program are primarily supported by our Department of Agricultural and Biosystems Engineering. Hatch funded projects include manure odor reduction, lignocellulosic based bio fuel, and the development of microorganisms to facilitate composting of plant materials. Activities being reported for SDSU Extension in this Planned Program include Subsurface Drainage Design and Water Management.

Food and Non-Food Products: Development, Processing, Quality, and Delivery

The research activities in this program are primarily supported by our Department of Agricultural and Biosystems Engineering, Department of Dairy Science, and our Department of Biology and Microbiology. Hatch funded projects include but are not limited to the manufacture of new dairy food products, technologies for improving food safety, and the development of oilseed biofuels. Activities being reported for SDSU Extension in this Planned Program include Barbeque Bootcamp.

Economics, Markets, and Policy

The research activities in this program are supported by our Department of Economics. Hatch funded projects include but are not limited to research involving agricultural commodity prices, energy and the environment, agricultural land market trends, and the economic impacts on wildlife and crop production from biofuel production. Activities being reported for SDSU Extension in this Planned Program include Ag CEO.

Human Nutrition, Food Safety, and Human Health and Well-Being

The research activities in this program are supported by our partnership with the College of Education and Human Sciences. Hatch funded projects include but are not limited to research involving dietary bioactive components, rural food environment, intervention to improve healthful behaviors in young adults, and dietary influences on obesity and chronic inflammation. Activities being reported for SDSU Extension include Food Safety Certification and Recertification, Food Processing and Food Marketing, Gerontology, Healthy Living, Smart Choices Grocery Store, New Roots for New Americans, and Community Gardens.

Families, Youth, and Communities

The research activities in this program are supported by our partnership with College of Education and Human Sciences. The Hatch funded project is research that involves psychological and behavioral factors that impact the decision to save. Activities being reported for SDSU Extension include Character Education, CYFAR, Native American Events, Teens as Teachers, Ripple Effect Mapping, and Building Community Capacity.

There are numerous activities and projects that take place within SDSU Extension that do not make their way into the Planned Programs of this report. These activities are part of the big picture and should be mentioned.

Food and Families

- Sioux Falls Food Policy Council - forum for issues like affordability of and accessibility to healthy foods
- Burke Wellness Coalition - supporting healthier lifestyles in Burke, SD
- Wisdom Keepers - caregiver training in Eagle Butte, SD
- Food Safety Scientist, Virtual Labs, KidQuest - programs developed and available on iGrow.org

Native American Programs

- South Dakota Indian Education Summit - Workforce Readiness
- South Dakota Indian Business Alliance - Workin' with Tradition - workforce development program
- Local Foods Conference - Rapid City, SD - market opportunities and challenges in Indian Country
- Lakota Nations Invitational Tournament and Education Conference - presentations and information booth
- Cheyenne Eagle Butte School - land preservation, water conservation, and environmental hazards
- Pine Ridge Reservation Collaborative Gardening - action plan to improve gardening skills
- Rosebud Reservation - Ranchers Workshop at Sinte Gleska University Antelope Campus, Mission, SD
- Pine Ridge Reservation - Growers Association, incorporating wild native foods into local food movement

Community Development

- Oil and Gas Development and the Effects on Community Development - presentation in Faith, SD
- Improving race relations and building cultural trust - community coaching in Wagner, SD
- Our Town Grants - coaching communities how to apply for grants
- South Dakota Young Trailblazers: Rural by Choice - Facebook page to connect our youth
- Proposed Dewey Burdock in-situ uranium project in Fall River County, SD - dealing with boom and bust
- South Dakota Discovery Center - connecting STEM with kitchen and garden
- Bison Economic Development Group - strategic planning
- Bridging the Gap - workforce development

Ag and Natural Resources

- After the Storm - meetings and programming in response to the devastating blizzard in October
- Sustaining the Legacy: Farm Transitions and Estate Planning
- Range Beef Cow Symposium - multistate efforts with SD, NE, CO, and WY
- I-29 Dairy Conference - multistate efforts with IA, MN, ND, and SD
- Annie's Project - Managing for Today and Tomorrow

4-H Youth Development

Robotics Day • 4-H Science, Technology, Engineering and Math (STEM) • Captain Cash
Sioux Empire Water Festival • Girls Engineering Math and Science (GEMS) • Livestock Clinics
Shooting Sports • South Dakota State Fair • CPR and First Aid • Character Counts • Quiz Bowl
Babysitting Workshop • Save Our Farm Youth Camp • Painting Class • Take a Stand
Fashion Revue • Tech Wizard Public Speaking • Achievement Days • Poultry Showmanship
Mapping, GPS and Rocketry

Total Actual Amount of professional FTEs/SYs for this State

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	70.0	0.0	192.6	0.0
Actual	87.2	0.0	176.7	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

All Hatch projects are subjected to peer review prior to implementation and require independent peer reviews from two scientists. The department head or a departmental executive committee identifies peer reviewers. The department head and the AES Director serve as merit reviewers. Reviewers are required to comment on why the proposed research is needed, it's relevance to agriculture, the target audience, and how it compliments other research. Proposals for research grants that are funded by stakeholder groups are subjected to review by the stakeholders themselves and by college administrators. SDSU Extension administrators serve as the merit review team for the plan of work. Department heads and program directors conduct peer reviews of programs.

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 specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

Stakeholder participation is solicited from many sources and events, including agricultural check-off groups, commodity groups, funding organizations, governmental agencies, elected officials and boards, public events and meetings, news releases, and industry associations. SDSU Extension seeks and receives stakeholder participation through focused conversations with representative

constituent groups reflective of outreach conducted via our Capstone Program Areas. The capstone groups are:

- Competitive Livestock Systems
- Competitive Cropping Systems
- Urban/Rural Interface
- Food & Families
- 4-H Youth Development
- Community Development
- Native American

Stakeholders are highly encouraged to participate in and take an active interest in SDSU Extension by providing direction, suggestions, and positive ideas. We ask stakeholders to share visionary strategies that meet the SDSU Extension mission, particularly in the capstone area they are representing. Stakeholders are encouraged to provide feedback and ideas for collaboration and partnership, and to help SDSU Extension reach and serve all demographic populations of the state. At the county level, County Commissioners are asked to maintain a county advisory structure that engages the local 4-H Promotion and Expansion Committee in the advisory role. This advisory structure predominantly gives guidance to county funded budgets and local 4-H expansion efforts.

Other Example Sources of Stakeholder Input:

- South Dakota Soybean Research and Promotion Council
- South Dakota Beef Industry Council
- South Dakota Corn Utilization Council
- South Dakota Oilseeds Council
- South Dakota Pork Producers Council
- South Dakota Wheat Commission Council
- South Dakota Department of Education and Cultural Affairs
- South Dakota Department of Health
- South Dakota Department of Social Services
- South Dakota Department of Economic Development
- Department of Energy
- Environmental Protection Agency
- South Dakota Department of Agriculture
- Office of State Veterinarian
- South Dakota Game, Fish and Parks
- Natural Resources Conservation Service
- Bureau of Indian Affairs
- South Dakota Weed and Pest Commission
- South Dakota 4-H Leaders Association
- South Dakota Association of County Commissioners

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
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Individuals and groups are identified through networking, attending conferences, public meetings, the internet, programming efforts, field tours, emails, and face-to-face arrangements.

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 the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups

Brief explanation.

Open dialogues are held with constituent groups to identify ways in which SDSU Extension can provide/develop outreach programs to meet identified needs to the targeted audience, whether that is a broad scale audience (ie. ag producers) or specific sub-audiences (beef producers). Capstone program areas will engage with their constituent groups on a quarterly to semi-annual basis. Written summaries of this feedback are produced and then shared on our web portal so they are accessible to staff and the general public. This feedback is then used to guide strategic program development within that program area.

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.

Administrators evaluate all input, requests and comments from stakeholders. SDSU Extension writes summaries of the discussions held by each capstone program group. Program Directors share the summaries specific to the capstone program area with department heads, faculty and specialists during program planning meetings. Stakeholder input is reviewed, considered and used as a basis to create SDSU Extension programs and AES research projects. Of note, the Southeast South Dakota Experiment Farm held its Annual Meeting of the Farm Board and conducted their planning review. Thirty board members and SDSU staff identified four high priority topics:

- High Tunnel Production
- Multi-Hybrid Planter
- Tile Drainage
- UAV/Drone Crop Monitoring

Brief Explanation of what you learned from your Stakeholders

Stakeholder input is very important to the Agricultural Experiment Station and to SDSU Extension. By soliciting input, we learn what the challenges are that they are facing and what they would like to see us do to address their challenges. We also learn what they believe the future of South Dakota looks like, what they see as opportunities, and what they think we can do to support those opportunities.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3667204	0	3182647	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	3416538	0	3182647	0
Actual Matching	3416538	0	3242954	0
Actual All Other	0	0	0	0
Total Actual Expended	6833076	0	6425601	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	378400	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Natural Resources and Environment
2	Plants and Their Systems
3	Animals and Their Systems
4	Agricultural, Natural Resource, and Biological Engineering
5	Food and Non-Food Products: Development, Processing, Quality, and Delivery
6	Economics, Markets, and Policy
7	Human Nutrition, Food Safety, and Human Health and Well-Being
8	Families, Youth and Communities

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Natural Resources and Environment

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	10%		8%	
102	Soil, Plant, Water, Nutrient Relationships	43%		19%	
103	Management of Saline and Sodic Soils and Salinity	0%		1%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		4%	
111	Conservation and Efficient Use of Water	3%		3%	
112	Watershed Protection and Management	0%		10%	
121	Management of Range Resources	30%		12%	
131	Alternative Uses of Land	4%		1%	
132	Weather and Climate	0%		3%	
133	Pollution Prevention and Mitigation	10%		4%	
134	Outdoor Recreation	0%		1%	
135	Aquatic and Terrestrial Wildlife	0%		24%	
136	Conservation of Biological Diversity	0%		8%	
141	Air Resource Protection and Management	0%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	2.7	0.0	52.8	0.0
Actual Paid	4.4	0.0	48.5	0.0
Actual Volunteer	0.1	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
170827	0	841476	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
170827	0	809857	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct Field and Lab Research
- Collaborate with Other States
- Partner with South Dakota Game, Fish and Parks
- Partner with the South Dakota Grassland Coalition
- Partner with Business Organizations
- Collaborate with Non-profit Organizations
- Conduct Soil Health Workshops and Field Tours
- Conduct Training for Concentrated Animal Feeding Operations
- Partner with the South Dakota Department of Environmental and Natural Resources
- Partner with the Natural Resources Conservation Service

2. Brief description of the target audience

- Wildlife and Fisheries Managers
- Scientists
- Natural Resource Management Specialists
- State and Federal Agencies
- Environmentalists
- Outdoor Enthusiasts
- Farmers, Ranchers and Producers
- General Public
- Operators of Concentrated Animal Feeding Operations

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3469	776348	551	4019

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

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	4	9	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Natural Resources and Environment

Year	Actual
2014	21

Output #2

Output Measure

- Increase Rancher's Knowledge of Grazing Techniques and Grassland Management

Year	Actual
2014	0

Output #3

Output Measure

- Number of CAFOs Participants

Year	Actual
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2014 20

Output #4

Output Measure

- Create Soil Health Learning Opportunities

Year	Actual
2014	12

Output #5

Output Measure

- Conduct Field Research to Determine the Effectiveness of the Canada Goose Damage Program

Year	Actual
2014	0

Output #6

Output Measure

- Research Climate Variability and Management Impacts on South Dakota Grasslands

Year	Actual
2014	0

Output #7

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	24

Output #8

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	85

Output #9

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	4

Output #10

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	45

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Natural Resources and Environment Hatch Research Projects
2	Number of Grazing School Participants
3	Number of CAFOs Training Sessions
4	Increase Soil Management Knowledge to Participants
5	Increase Knowledge to Control the Canada Goose Population
6	Produce Knowledge to Implement a State-and-Transition Model for South Dakota Grasslands

Outcome #1

1. Outcome Measures

Number of Natural Resources and Environment Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Dakota has a wide diversity of natural resources that depend on maintenance and good stewardship of the land. Too much grazing, urban sprawl, the creation of reservoirs, plant invasion, feedlot runoff, global warming, as well as the growing world economy all contribute to the degradation of our natural resources.

What has been done

Within the College of Agricultural and Biological Sciences, there are 28 Hatch projects that are categorized in the Planned Program of Natural Resources and Environment. The research activities in this program are primarily supported by our Department of Natural Resource Management. Projects include but are not limited to research studies in climate variability, crop impact from Canada geese, watershed management, soil productivity, bioenergy, wildlife habitat, carbon sequestration, pollution prevention, and range management.

Results

Through research, our Department of Natural Resource Management continues to build a scientific knowledge base to improve and understand the management of natural resources in South Dakota. Examples include:

Atmospheric nitrogen deposition on native prairie, anthraquinone effectiveness on soybean plants, prevention of nitrates through tile drainage, newly discovered insect species, construct elemental fingerprints of reservoir ecosystems, climate change effects on beaver-created wetlands, and biomass yield from switchgrass land. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
141	Air Resource Protection and Management

Outcome #2

1. Outcome Measures

Number of Grazing School Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are approximately 22 million acres of permanent pasture and rangeland in South Dakota. Rangeland is the lifeline of streams, ponds and lakes, and it is a source of wildlife habitat, recreation and scenic beauty. Rangeland is fragile and is profoundly impacted by management. The grazing lands of the Northern Plains are recognized as one of the most threatened ecosystems globally. As grazing lands are predominantly privately owned and managed, principally for livestock production, secure and profitable ranching is necessary to conserving this vital resource.

What has been done

In cooperation with the South Dakota Grasslands Coalition and several other entities, SDSU Extension has partnered in grasslands management training to more than 265 ranchers for the last 11 years. An additional 30 participants were trained in 2014. Ranchers participated in classroom presentations as well as hands-on field activities. Additional events include the Rangeland Bird Tour, Range Management Ranch Tours, and the annual Rangeland Days and Soil Days. A climate variability workshop series is also underway in response to the need for more management information dealing with drought, blizzards and floods.

Results

With its partners and the South Dakota Grazing School, SDSU Extension has helped producers of all ages become more skilled at reading their landscape. As new participants are reached, there is an increase in knowledge of many topics, including managing diversity on rangelands, pasture allocation, holistic management, soil health and infiltration, plant identification, and concepts of grazing. By better understanding the grassland conditions of their property, ranchers develop the skills needed to detect important information both beneficial and detrimental to their grasslands. The workshops and activities also allow producers to network, sparking creativity to help find solutions to their own challenges.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources

Outcome #3

1. Outcome Measures

Number of CAFOs Training Sessions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Large-scale livestock producers, known as Concentrated Animal Feeding Operations (CAFOs),

create potential water and air quality conflicts for rural communities in South Dakota. There is a need for the development of these operations, but environmental laws must be followed and good will with neighbors is imperative for the sustainability of large operations. Any CAFO that is applying for a General Permit must attend the course.

What has been done

SDSU Extension, the South Dakota Department of Environment and Natural Resources, and the Natural Resources Conservation Service provide training two-three times a year for federal and state water pollution and control programs. The training sessions included topics on livestock production, manure management and land application practices. In addition, SDSU Extension Specialists discuss the management of nitrogen and phosphorus content of manure and air quality and odor.

Results

Approximately half of the participants were required to be at the training sessions and about half of them attended for the learning experience. The sessions represented approximately 4,000 animals in the beef industry, 500 animals in the dairy industry, and 10,200 animals in the swine industry. Survey results show a 20% to 30% increase in the overall understanding of the topics and an 92% overall satisfaction rate with the program. Over sixty-five percent of the participants who had not already adopted some of the practices demonstrated said they plan to adopt certain practices they learned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Increase Soil Management Knowledge to Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	871

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With the increase in demand for global food production, it is essential to promote soil health. The same management practices that can improve soil health can also damage soil health if not done correctly. Producers need access to all available tools and information to remain environmentally sound, profitable, and sustainable.

What has been done

SDSU Extension conducted multiple workshops, field days, agronomy courses, no-till demonstrations, and Integrated Pest Management training throughout South Dakota. Research is being conducted for state-wide recalibration of corn nitrogen recommendations and long-term no-till involving cover crops and no cover crops. Numerous articles have been written and posted on the iGrow learning platform.

Results

Producers and landowners gained knowledge that will not only encourage them, but will also challenge them to incorporate production practices that will help promote soil health. The increases in knowledge of fertilizers, pesticides, cover crops, and tillage practices help South Dakota's soil stay productive and profitable. The citizens of the state also benefit from better water quality and a better environment overall.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Increase Knowledge to Control the Canada Goose Population

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Since the early 1900's, there has been a rapid decline in Giant Canada geese in South Dakota. Through restoration programs, Canada geese populations today have increased to the point that farmers register complaints that the geese are damaging crops, particularly soybeans. Research

is needed to generate harvest parameters and survival rates estimates for the Canada goose population.

What has been done

The SDGFP Canada goose damage program allows landowners that file a complaint free access to abatement techniques. Little research has been conducted on flightless Canada geese that cause crop damage during the brooding and molting period. Currently, South Dakota AES is evaluating the effectiveness of several commercial chemical goose deterrents on soybeans in northeast South Dakota. New methods to reduce crop damage caused by Canada geese are being identified.

Results

Several chemicals were examined to determine if the substances were effective at reducing damage to soybeans caused by Canada geese. The chemical anthraquinone was found to be effective when sprayed on soybean plants. Field research continues to refine treatment rates and application processes. Information has been provided to chemical companies, wildlife managers and producers. One graduate assistant was trained in application of anthraquinone.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #6

1. Outcome Measures

Produce Knowledge to Implement a State-and-Transition Model for South Dakota Grasslands

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Climate variability complicates our ability to manage invasive plants and pests, rangeland quality, and livestock production. Changes in grazing pressure are triggers that lead to alterations in rangeland productivity and plant community structure. To better describe these changes, a State-

and-Transition Model for South Dakota Grasslands is needed.

What has been done

Research is ongoing to determine the impacts of climate variability, increased nitrogen deposition, and management on resistance and resilience to plant community change and primary production of eastern South Dakota grasslands. SDSU AES will also continue to apply the clipping, fire, and simulated atmospheric nitrogen deposition to the long-term native plant community plots in eastern South Dakota.

Results

A manuscript was published on the findings of increased atmospheric nitrogen deposition on native prairie under management of fire and simulated grazing. A new study was initiated to test the resistance and resilience of plant community to drought using automated rainout shelters. Additional funding was received from NRCS-CIG to conduct a project to demonstrate the resistance and resilience of well managed plant communities versus poorly managed plant communities to drought in a joint South Dakota and Nebraska project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Concentrated Animal Feeding Operations

Pre and Post Surveys
12 of 20 Participant Responses

92% - Overall Participant Satisfaction with the Program

Understanding of the Topic before Program

55% - Water Quality

57% - Permit

66% - Land Application

65% - Worksheets

68% - Conservation

50% - Nutrition

49% - Air Quality

Understanding of the Topic after Program

81% - Water Quality

86% - Permit

93% - Land Application

85% - Worksheets

91% - Conservation

78% - Nutrition

78% - Air Quality

Participants that Have Already Adopted Practices

30% - Land Application

30% - Conservation

45% - Nutrition

10% - Air Quality

Percentage of Remaining Participants that Plan to Adopt Practices

90% - Land Application

82% - Conservation

85% - Nutrition

67% - Air Quality

Key Items of Evaluation

Concentrated Animal Feeding Operations

The CAFOs sessions represented approximately 4,000 animals in the beef industry, 500 animals in the dairy industry, and 10,200 animals in the swine industry. Survey results show a 20% to 30% increase in the overall understanding of the topics and an 92% overall satisfaction rate with the program.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Plants and Their Systems

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
201	Plant Genome, Genetics, and Genetic Mechanisms	1%		22%	
202	Plant Genetic Resources	1%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		26%	
204	Plant Product Quality and Utility (Preharvest)	3%		3%	
205	Plant Management Systems	11%		14%	
206	Basic Plant Biology	13%		4%	
211	Insects, Mites, and Other Arthropods Affecting Plants	24%		5%	
212	Diseases and Nematodes Affecting Plants	12%		7%	
213	Weeds Affecting Plants	4%		1%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	0%		2%	
215	Biological Control of Pests Affecting Plants	0%		2%	
216	Integrated Pest Management Systems	31%		6%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	8.1	0.0	64.2	0.0
Actual Paid	10.5	0.0	51.1	0.0
Actual Volunteer	4.6	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
409984	0	686379	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
409984	0	718933	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Collaborate with the USDA Sunflower Research Unit
- Conduct Research on Soybean Nodule Development
- Collaborate with the South Dakota Bureau of Indian Affairs
- Develop Novel Wheat Cultivars
- Conduct Research on Economic Impacts of Fungal Diseases
- Develop Superior Sunflower Germplasms
- Breed Perennial Grasses and Legumes for Bioenergy Production
- Analyze and Map Genes for Soybean Resistance of Aphids
- Develop New Multi-Purpose Oat Varieties
- Conduct Pesticide Applicator Training Sessions
- Conduct Integrated Pest Management Training Sessions
- Disseminate Research Results to the Public

2. Brief description of the target audience

- Oilseed and Other Specialty Crop Growers
- Research Community
- Soybean Growers
- Wheat Growers
- Corn Growers
- Biofuels Crop Industry
- Producers
- Graduate Students
- Private and Commercial Pesticide Applicators

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11327	919399	1559	12592

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

Patent Applications Submitted

Year: 2014

Actual: 1

Patents listed

Variety: Redfield

Taxon: Triticum aestivum L.

Crop: Wheat, common

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	16	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Plants and Their Systems

Year	Actual
2014	27

Output #2

Output Measure

- Number of Pesticide Applicator Training Sessions

Year	Actual
2014	122

Output #3

Output Measure

- Number of High Tunnel Workshops Conducted
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of Integrated Pest Management Training Events Conducted

Year	Actual
2014	62

Output #5

Output Measure

- Conduct Research for Improved Oilseed Production

Year	Actual
2014	0

Output #6

Output Measure

- Identified Proteins in Corn and Wheat

Year	Actual
2014	0

Output #7

Output Measure

- Conduct Research on Spring Wheat Cultivars

Year	Actual
2014	0

Output #8

Output Measure

- Conduct research of Nodule Development in Soybeans

Year	Actual
2014	0

Output #9

Output Measure

- Increase Pollinator and Pollinator Habitat Knowledge

Year	Actual
2014	0

Output #10

Output Measure

- Number of Master Gardener Training Sessions

Year	Actual
2014	35

Output #11

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	120

Output #12

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	176

Output #13

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	14

Output #14

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	104

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Plants and Their Systems Hatch Research Projects
2	Number of Pesticide Applicator Training Participants
3	Number High Tunnel Workshop Participants
4	Number of Integrated Pest Management Participants
5	Increase Oilseed Crop Knowledge and Productivity and Profitability
6	Enhanced the Understanding of Biotic and Abiotic Stress Resistance in Crop Plants
7	Release Spring Wheat Cultivars
8	Enhance Understanding of microRNAs Affecting Nodule Development in Soybeans
9	Number of Citizen Science Volunteers
10	Number of Participants Completing Master Gardener Training

Outcome #1

1. Outcome Measures

Number of Plants and Their Systems Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Crop diseases, insect pests, drought, changing climatic conditions, soil erosion, and fewer acres of land available for farming are all serious production constraints for all crops produced in South Dakota.

What has been done

Within the College of Agricultural and Biological Sciences, there are 35 Hatch projects that are categorized in the Planned Program of Plants and Their Systems. The research activities in this program are primarily supported by our Department of Plant Science and our Department of Biology and Microbiology. Projects include but are not limited to research studies in oilseed production, nodule development in soybeans, wheat genetics and genomics, perennial grasses for bioenergy, crop pests and diseases, grapevine mapping, and improved alfalfa production.

Results

Through research, we continue to build a scientific knowledge base to improve and understand plant varieties, increased agricultural productivity, plant diseases, and the impacts of tillage on soil carbon levels. Examples include:

The development of high-yield, pest resistant sunflower, oil extraction from oilseeds for biofuel production, wheat cultivars with elevated resistance to Fusarium head blight, prairie Cordgrass for remediating salt-impacted soils, and soybean plants that produce more of its own nitrogen. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

Number of Pesticide Applicator Training Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4567

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Producers planning to apply any pesticide to a commodity worth \$1,000 or more must be certified as a private applicator. Anyone that applies pesticides for hire must be certified and licensed as a commercial applicator.

What has been done

SDSU Extension organized and participated in 69 commercial applicator sessions and 43 private applicator training sessions across the state. Fifteen commercial categories were covered. Speakers at the sessions included SDSU Extension Specialists, State Department of Agriculture representatives, and State Department of Environment and Natural Resources.

Results

Participants enhanced their knowledge and understanding of safe and sustainable methods to apply pesticides. Topics covered during these trainings include proper selection of personal protective equipment, understanding and comprehension of label languages, resistance development on weeds and insects and ways to prevent its development, proper technique to measure pesticides and calibrate pesticide application equipment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #3

1. Outcome Measures

Number High Tunnel Workshop Participants

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of Integrated Pest Management Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2787

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the past decade, new invasive pests have been identified through the work of the SDSU Plant Diagnostic Lab, SDSU Extension Specialists, and the SDSU IPM program. And there is evidence that several common pests are becoming pesticide resistant. The proper identification of pests and the pest control measures used have a direct influence on the profitability of the farm operation. Without the improved knowledge of pest biology, unacceptable levels of pest damage

can occur and pose risks to people, property and the environment.

What has been done

The South Dakota IPM Program is a collaborative effort between public and private agencies, multiple states, SDSU Extension, and SDSU Research. Approximately 2,787 people attended 62 training events in 2014, which included research farm tours, pesticide recertifications, workshops, field tours, and crop consultants' updates. More than 7,500 people visited SDSU Extension's traveling displays. The SDIPM Program also worked with the SD Bureau of Indian Affairs on noxious weeds and the Crow Creek tribe after finding and confirming a new invasive crop weed.

Results

Participants of the South Dakota IPM Program have increased their knowledge of pest biology, disease identification, pesticide label interpretation, pesticide handling, and environmental factors. This leads to increased use of IPM practices and objective, science-based decision-making on reducing risks from pests and preventing unacceptable levels of pest damage in both agricultural and residential settings. The increased use of IPM practices results in better pest management decisions which address the economic aspects of pest management while posing the least possible risk to people, property, resources, and the environment. Through this program, professional agronomists receive the best up-to-date information available to advise their clientele. Producers are then able to make sound crop pest management decisions that are economically beneficial to their operations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Increase Oilseed Crop Knowledge and Productivity and Profitability

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Oilseed crops are important to South Dakota, which is currently the second leading producer of sunflower and flax in the United States. With a unique environment for sunflower production, South Dakota can benefit from genetic material specifically developed for this region. Other oilseed crops such as camelina and Carinata show promise as feedstocks for the production of biodiesel or jet fuel.

What has been done

SDSU AES conducted research with USDA-ARS and other researchers on sunflower and other oilseed crops. The research sought to develop sunflower populations and lines that contain high yield, quality, and pest resistance, and make them available to the seed industry for development of South Dakota adapted varieties. The research also evaluated sunflower hybrid performance and alternative oilseed crops. Trial sites were planted in many locations throughout South Dakota.

Results

With superior genotypes of sunflower breeding lines selected, data were collected on seed yield, seed oil content, days to flower, plant height, lodging, disease incidence. Several lines resistant to the red sunflower seed weevil were developed through cooperative efforts with the USDA Sunflower Research Unit in Fargo, North Dakota. At least two of the lines will likely be released in 2015. Performance trials of commercial oilseed and confection sunflower hybrids were conducted at multiple sites and the results were made available to farmers through the iGrow teaching platform and an Extension bulletin. Oil extraction and economic analyses are in progress and will help to determine which alternative oilseeds have the greatest potential for production as biofuel feedstock crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants

Outcome #6

1. Outcome Measures

Enhanced the Understanding of Biotic and Abiotic Stress Resistance in Crop Plants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stress is a major factor in limiting plant growth, development and crop productivity. The discovery of unique proteins in resistant cultivars is important for plant breeders to develop better crop plants. Improved crop tolerance plants are necessary to keep pace with future food demands.

What has been done

The screening of 14 imported germplasms of wheat along with five South Dakota local germplasms for drought and heat tolerance at physiological and genomic levels was completed. During physiological studies of wheat it was noticed that photosynthesis is the major activity at plant level that get affected with the limitation of water and high temperatures in susceptible germplasms compared to the resistant ones. By doing global proteomic experiments, several putative candidate genes were identified that play major roles in protecting the photosynthetic systems in the resistant germplasms. A protein-protein interaction network between these proteins by applying bioinformatics approach was established.

Results

With the completion of this project, a total of 100 genes were identified for drought, heat, and scab responses in economically important field crops. A goal was to enhance public understanding for science and to increase the interest for careers in science and technology. The results were disseminated to producers, students, faculty and other researchers. Peer reviewed journal articles, magazines, and presentations were all used to reach the public. Through this project, two students graduated in the agricultural sciences field.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Release Spring Wheat Cultivars

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Dakota's spring wheat producers desire cultivars that are adapted to a large geographic area, reliably produce high yields with little or no loss to disease or abiotic stress, and have acceptable test weight, protein levels, and other end-use qualities. Research in applied plant breeding methods is needed to develop and release cultivars that meet or exceed the expectations of South Dakota spring wheat producers.

What has been done

The SDSU spring wheat breeding and genetics program conducted applied and basic research focused on increasing grain yield and general agronomic performance potential of new spring wheat cultivars. This was carried out through utilizing South Dakota growing environments to select and advance promising experimental breeding populations and lines that possess increased yield potential and stability, elevated levels of disease and abiotic stress resistance, as well as increased end-use quality parameter values.

Results

An illustration of economic impact, which results from genetic gain, can be developed through comparing the performance of Focus with the performance one that was released previously. 'Briggs' was released by this program in 2002 and was very popular among growers for several years. Over all AYT locations during years 2012 through 2014, Focus produced approximately 2.7 more bushels of grain per acre than Briggs. At a market value of \$5.00 per bushel, this equates to an advantage of \$13.50 per acre that is available to growers that choose to plant this new cultivar as opposed to continually growing Briggs. Although Focus does consistently produce more grain than Briggs, it was largely released for its elevated levels of resistance to Fusarium head blight.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
212	Diseases and Nematodes Affecting Plants

Outcome #8

1. Outcome Measures

Enhance Understanding of microRNAs Affecting Nodule Development in Soybeans

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nitrogen is a major plant nutrient and a main component of chemical fertilizers for crops. A soybean plant that can produce more of its own nitrogen will require less fertilizer, which will lower production costs and reduce the potential for runoff. Studying nodule development in soybean, a major food, feed and potential biofuel crop is of high significance in modern U.S agriculture.

What has been done

During the last three years, SDSU researcher Senthil Subramanian and his team have identified nearly 150 microRNAs that may potentially affect nodule development. And they have documented how microRNA 160 affects nodule development. Last fall, Subramanian received a five-year National Science Foundation Faculty Early Career Development award for nearly \$660,000 to support this work.

Results

A negative role for auxin in nodule development was identified via a regulatory circuit involving miR160 and its target ARF transcription factors. A hypothetical model was developed for its role during drought stress to regulate nodule formation.

A key role for local auxin and gibberellin biosynthesis during nodule formation was identified from the analysis of transcriptomics data. Functional validation of additional hypothesis is in progress. Comparison of physiological and morphological parameters during colonization of soybean with rhizobia of varying efficiencies has identified early markers associated with partner selection.

Two graduate students and two undergraduates were trained in RNA-Seq analysis of global gene

expression, designing loss and gain of function experiments, examination of nodule development, bioinformatics, and composite plant transformation. In addition, one of the undergraduates received training in fluorescence and confocal microscopy.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Number of Citizen Science Volunteers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pollinators are necessary for fruit production and seed set in many home garden and agricultural crops. Bees are great pollinators, but there has been a decline in their population during the last half century. The disappearance of large numbers of honey bees in the mid-2000s, called colony collapse disorder, concerned both the bee-keeping industry and the general public. Populations of native bees are also at risk, due to habitat loss, disease, pesticide use, and other possibly unknown causes. Community engagement is needed to help increase local pollinator population and diversity.

What has been done

The Backyard Biodiversity program uses citizen science (active involvement from everyday people) to improve awareness of pollinators, and create and conserve pollinator habitat. An observation protocol and data sheet was developed for participants. Training was provided on the data collection methods and basic insect identification through a series of webinar training sessions that were recorded for reference. The protocol focused on identifying broad groups of insects like butterflies, flies, beetles and bees.

Results

Seventeen volunteers submitted data for the project totaling more than 1400 insect observations. The volunteers were mostly Master Gardeners. The bee bowl collections were completed at 3 sites and resulted in more than 150 pinned insects that are awaiting identification. The most common bee bowl catches were flies and bees, with a few small butterflies and the occasional beetle. Due to the volume of specimens collected, the final identification data will be available in 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #10

1. Outcome Measures

Number of Participants Completing Master Gardener Training

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	72

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

High food costs and the lack of ability in small rural communities to obtain high quality fresh fruits and vegetables have led to the need for increased garden education. Schools, community groups, the elderly, and service groups have requested information on basic gardening skills, assistance with starting gardens, and having basic garden questions answered. Home gardeners also want to know how to better take care of their yards and the plants growing in them.

What has been done

The Master Gardener program provides horticulture training to individuals who then volunteer in their communities; teaching neighbors, friends and others valuable gardening skills. Hands-on learning is an important part of the program, but the addition of online training allows more people to be reached, especially in remote locations. Seventy-two Master Gardeners completed the training and are now engaged in the volunteer service in their communities.

Results

Through the close partnership of SDSU Extension and Master Gardeners, citizens across South Dakota have access to public education that enables them to improve their health and lifestyle by growing nutritious foods. Adults and youth have gained confidence that their gardening skills are based on accurate, research-based information. By growing their own food, gardeners are saving money, eating fresher produce, and making their own decisions about pesticide use. During this reporting period, Master Gardeners volunteered over 12,700 hours, a value of approximately \$241,800.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Focus Wheat Cultivar

Even though it was largely released for its elevated resistance to Fusarium head blight, Focus produced approximately 2.7 more bushels of grain per acre than Briggs, which was released in 2002 and was very popular for several years. At a market value of \$5.00 per bushel, this equates to an advantage of \$13.50 per acre.

Key Items of Evaluation

Focus Wheat Cultivar

New cultivar Focus produced approximately 2.7 more bushels of grain per acre than Briggs, which was released in 2002. At a market value of \$5.00 per bushel, this equates to an advantage of \$13.50 per acre.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Animals and Their Systems

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
301	Reproductive Performance of Animals	16%		13%	
302	Nutrient Utilization in Animals	7%		25%	
303	Genetic Improvement of Animals	0%		5%	
304	Animal Genome	4%		5%	
305	Animal Physiological Processes	0%		5%	
306	Environmental Stress in Animals	4%		1%	
307	Animal Management Systems	45%		11%	
308	Improved Animal Products (Before Harvest)	6%		3%	
311	Animal Diseases	4%		27%	
313	Internal Parasites in Animals	0%		3%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	2%		0%	
315	Animal Welfare/Well-Being and Protection	12%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	30.7	0.0
Actual Paid	11.3	0.0	27.5	0.0
Actual Volunteer	0.5	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
444150	0	810073	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
444150	0	834456	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Quantify Nutrient Supply for Lactating Cows
- Develop Vaccine Technologies
- Research Methodologies to Increase Reproductive Performance in Animals
- Conduct Research that Leads to Muscle Growth Augmentation
- Determine the Effects of Co-product Based Lamb Finishing Diets
- Conduct Sheep Production Workshops
- Coordinate Value-Based Marketing System for Cow-calf Operations
- Develop Beef Production Workshops
- Conduct Ranch Visits
- Conduct Farm Tours

2. Brief description of the target audience

- Veterinarians
- Dairy Producers
- Producers of Ethanol Co-products
- Cattle Producers
- Swine Producers
- Muscle Biologists
- Livestock Nutritionists
- Sheep Industry
- Cow-calf Producers

3. How was eXtension used?

SDSU Extension provided the project manager and Ask the Expert manager for DAIRYeXNET.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6314	2268764	1635	3698

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

Patent Applications Submitted

Year: 2014

Actual: 4

Patents listed

1. PRRSV Vaccine Candidate
2. PRRSV Vaccine Candidate
3. Novel Arterivirus Protein and Expression Mechanisms
4. Multiepitope Fusion Antigens and Vaccines and Their use in Treatment of Enterotoxigenic Diarrhea

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	10	35	45

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Animals and Their Systems

Year	Actual
2014	24

Output #2

Output Measure

- Launch sheepSD as a Learning Opportunity for Sheep Producers
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Demonstrate Value-Based Marketing to Cow-calf Producers

Year	Actual
2014	0

Output #4

Output Measure

- Provide Management Tools to Beginning Cattle Ranchers
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of Learning Activities for Sheep Producers or Consumers

Year	Actual
2014	17

Output #6

Output Measure

- Create Learning Opportunities in the Beef Industry

Year	Actual
2014	13

Output #7

Output Measure

- Published and Disseminated Results of Nutritional Studies in Sheep Diets

Year	Actual
2014	0

Output #8

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	10

Output #9

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	234

Output #10

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	11

Output #11

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	118

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Animals and Their Systems Hatch Research Projects
2	Number of Sheep Operations Participating in sheepSD
3	Number of Cow-calf Operations Participating in the Calf Value Discovery Program
4	Number of beefSD Participants
5	Number of Individuals Participating in Sheep Production Learning Activities
6	Number of Individuals Participating in Beef Production Learning Activities
7	Enabled Further Research to Explore Diet Formulation Strategies for Feeding Ruminant Livestock

Outcome #1

1. Outcome Measures

Number of Animals and Their Systems Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	31

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Production costs are the determining factor in livestock producer profitability. High feed costs, poor reproductive performance, and disease are primary concerns for producers and scientists.

What has been done

Within the College of Agricultural and Biological Sciences, there are 27 Hatch projects that are categorized in the Planned Program of Animals and Their Systems. The research activities in this program are primarily supported by our Department of Animal Science, Department of Dairy Science and our Veterinary and Biomedical Sciences. Projects include but are not limited to research studies in co-product feeds for sheep, genetic architecture of traits in beef cattle, milk production management for dairy cattle, vaccines for viral diseases, and reproductive efficiency in cattle.

Results

Through research, we continue to build a scientific knowledge base to improve and understand production efficiency and product enhancement, and to prevent and detect animal and human diseases. Examples include:

Lamb finishing diets of soy hulls, DDG and treated corn stover, methods of controlling estrus and ovulation in cattle, heifer growth performance on reduced fat distillers dried grains, swine and bovine influenza viruses, and feeding strategies to optimize piglet quality and sow longevity. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection

Outcome #2

1. Outcome Measures

Number of Sheep Operations Participating in sheepSD

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of Cow-calf Operations Participating in the Calf Value Discovery Program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The success of a cow-calf operation can come down to the marketing strategy employed by the producer. Retained ownership is a program that allows producers the opportunity to start with as few as five of their own calves and pool them with other calves to see how they perform in a feedlot. Retained ownership can provide the greatest opportunity to realize the true value of cattle, but it can also have increased economic risks.

What has been done

SDSU Extension coordinated the Calf Value Discovery Program, a retained ownership program in which 11 cow-calf operations participated with 164 calves. The calves were vaccinated, dewormed, individually identified, and weighed. They were consigned to a local feed yard where they were fed in a single pen, visually evaluated and sold in semi-load lots.

Results

The Calf Value Discover program provides feedback to producers on feeding performance and carcass characteristics of calves. The data provides a benchmark for comparison with cattle from other operations and it also provides useful guidelines for making selection and marketing decisions in the future. Several producers are using the data to influence their breeding program and some producers are using the data to market their calves for a higher price.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #4

1. Outcome Measures

Number of beefSD Participants

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of Individuals Participating in Sheep Production Learning Activities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	169

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sheep and lamb inventory in the United States has been declining over the last few decades. Producers nationwide need to grow their flocks to meet the demands of wool and high quality lamb meat and at the same time keep their operations sustainable. Many beginning operators have limited knowledge and resources for productive sheep enterprise operations, land use management, and business planning. The survival of rural communities is critically tied to productive and profitable agriculture.

What has been done

With its partners, SDSU Extension continues to support the sheep industry with producer education and mentorship programs. SDSU Extension's signature program sheepSD helps potential and beginning sheep ranchers enter and expand the sheep industry. The beginning ranchers learn the skills needed for producer efficiency, profitability and sustainability. SDSU Extension hosted the 2014 South Dakota Sheep Growers Association Annual Convention. Extension and research personnel in the four-state region of SD, ND, WY and MT contribute to the success of the sheepSD participants.

Results

Fourteen operations, the same as last year, participate in the sheepSD program, but the membership of Growing South Dakota Sheep Producers has grown to 57 people. This group has close ties to sheepSD but is not able to commit as much time to the program. They are comprised of sheep producers, loan officers, sheep shearers and order buyers; participating frequently and contributing to the learning opportunities. Attendance to the South Dakota Sheep Growers Associations Convention has grown from 54 attendees in 2012 to 157 in 2014. Participants at the convention gained knowledge in lamb carcass fabrication, sheep management practices, improving the wool clip, lamb cookery, and the devastating disease, ovine progressive pneumonia.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection

Outcome #6

1. Outcome Measures

Number of Individuals Participating in Beef Production Learning Activities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	16

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are many opportunities in the beef industry, but there are also many risks involved. As the average age of agriculture producers in South Dakota continues to rise, the industry must recruit more young people. And to be competitive, beginning beef producers need relevant and timely information in the areas of livestock production, natural resource stewardship, marketing, financial management, business, and risk and legal management.

What has been done

Since 2010, when SDSU Extension launched its signature program, beefSD, 59 beginning producers from 29 operations have been enrolled. Sixteen of those producers participated in this reporting period. The participants attended workshops, travel study trips, case studies, web-based interaction, and Facebook forums. The beefSD program also participated in the South Dakota Grazing School and the Calf Value Discovery Program.

Results

Beef producers have been provided a wide variety of tools to help them make wise management decisions. During a five day travel-study across the Midwest to Chicago, participants gained valuable knowledge in evaluating alternative production systems, market risk management, meat markets, and support enterprises. Webinars and classroom activities provided financial and strategic planning curriculums and case study workshops focused on seedstock and grass fed production. Mentoring relationships, a key component of beefSD, have been established and are leading to the development of management teams.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #7

1. Outcome Measures

Enabled Further Research to Explore Diet Formulation Strategies for Feeding Ruminant Livestock

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The rapidly expanding biofuels industry has increased the availability of co-product feeds for sheep. Co-product feeds such as soybean hulls, dried distillers grains, and glycerol are often more favorably priced than traditional feeds, but further evaluation is needed to determine the impact on performance, profitability, and efficiency of co-product based diets.

What has been done

Lamb finishing diets were formulated exclusively with co-products to supply dietary energy and protein. Co-product ingredients were soy hulls, DDG and treated corn stover. Corn stover inclusion was 0, 10, 20 or 40%. Results from this study demonstrated that up to 20% corn stover in a pelletized lamb finishing diet resulted in similar growth performance to animals fed 0% corn stover. However, lamb response to diets formulated with 40% corn stover tended to decrease intake by 9% and resulted in a lower average daily gain.

Results

Summary results from this research project have been disseminated to producers, feed manufacturers, private consultants, industry representatives, veterinarians, extension personnel and scientists. With the completion of this project, two graduate students have gained valuable experience toward the fulfillment of their Animal Science masters degrees. During their training they published and presented abstracts, proceedings reports, and reviewed publications were accepted or expect to be accepted for publication. The knowledge gained from this project could significantly impact the profitability and sustainability of the sheep industry in the United States.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Calf Value Discovery Program

On average, feeding costs were \$528.39 per animal. This equates to a total cost of gain of \$77.67/100 lb. When carcasses were sold on a grid marketing basis, price ranged from \$1,171.22 to 2,414.23 but had carcasses been sold on a dressed basis this range would have been narrower (\$1,302.57 to \$2,364.96). When including the value of the feeder calf, there was a \$850.97 dollar per animal range in return from a loss of \$268.49 to a profit of \$582.48. However, on average total profit was \$263.85 per animal.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Agricultural, Natural Resource, and Biological Engineering

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
401	Structures, Facilities, and General Purpose Farm Supplies	0%		10%	
402	Engineering Systems and Equipment	0%		10%	
403	Waste Disposal, Recycling, and Reuse	0%		63%	
404	Instrumentation and Control Systems	0%		13%	
405	Drainage and Irrigation Systems and Facilities	100%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	3.6	0.0	2.5	0.0
Actual Paid	4.4	0.0	2.4	0.0
Actual Volunteer	0.1	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
170827	0	25190	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
170827	0	27175	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct Research to Produce Graphene from Biochar
- Investigate the Impact of Manure Management Practices
- Conduct Research to Create New Sources of Biomass
- Conduct Drainage and Water Management Design Workshops

2. Brief description of the target audience

- Supercapacitor and Energy Industries
- Livestock Facilities
- Biofuel Industry
- Scientists
- Farmers
- Landowners
- Drainage Contractors

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2849	116796	856	4573

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

Patent Applications Submitted

Year: 2014

Actual: 2

Patents listed

1. Exhaust System/Air Filtration Method
2. Rotating Fluidized Bed for Catalytic Pyrolysis

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	22	22

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Agricultural, Natural Resource, and Biological Engineering

Year	Actual
2014	2

Output #2

Output Measure

- Number of Drainage and Water Management Design Workshops

Year	Actual
2014	4

Output #3

Output Measure

- Conduct Research on Carbon Materials and Biofuel Technologies

Year	Actual
2014	0

Output #4

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	36

Output #5

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	91

Output #6

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	5

Output #7

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	34

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Agricultural, Natural Resource, and Biological Engineering Hatch Research Projects
2	Number of Drainage and Water Management Design Participants
3	Enhance Understanding of Bio-renewable Graphene Production

Outcome #1

1. Outcome Measures

Number of Agricultural, Natural Resource, and Biological Engineering Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Livestock facilities are growing in size and are increasingly coming under air and water quality regulations. Data is needed for improved site-specific estimates of emissions and manure nutrient values. Research is also needed in biomass technology to enhance the energy security of the United States.

What has been done

Within the College of Agricultural and Biological Sciences, there are three Hatch projects that are categorized in the Planned Program of Agricultural, Natural Resource, and Biological Engineering. Projects include manure odor reduction, lignocellulosic based bio fuel, and the development of microorganisms to facilitate composting of plant materials.

Results

Through research, our Department of Agricultural and Biosystems Engineering has continued to build its knowledge base that impacts new innovations and design systems in agriculture.

Examples include:

The impact of manure management practices on air quality and nutrient value from mono-sloped beef cattle facilities, development of biochemical or thermochemical pretreatment technologies that lead to the economical production of lignocellulosic based bio fuel, and to further characterize microbial samples that might have ability to both fix dinitrogen gas and break down some components of lignocellulose. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #2

1. Outcome Measures

Number of Drainage and Water Management Design Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	205

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increases in precipitation and land and commodity prices along with new technologies have led to increased interest in subsurface (tile) drainage to address excess moisture concerns. Good drainage design requires an understanding of soils, topography, drainage system, legal, and environmental factors. Improper drainage design results in systems that provide less than desired benefits or greater than desired environmental impacts.

What has been done

A multistate effort among SDSU Extension and North Dakota State University and the University of Minnesota Extension services, along with industry partners, conducted workshops that included topics on drainage design fundamentals, managed drainage design, soil principles, lift stations, design tools, agronomic considerations, and legal and wetlands issues. The workshops concluded with participants working in small groups to design a drainage system for one of their own fields or an example field.

Results

Of the evaluation respondents from the South Dakota workshop, 100% rated the overall program as useful or very useful. Six of the 12 workshop sessions were directly related to drainage design and generally rated highest for usefulness for knowledge gained from the workshop. Many

participants indicated that the information they learned from the workshop would help them better design their own tiling projects, evaluate contractor designs, or advise clients on drainage design. Several participants also indicated that they would now consider drainage water management as a best management practice.

4. Associated Knowledge Areas

KA Code	Knowledge Area
405	Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

Enhance Understanding of Bio-renewable Graphene Production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Before supercapacitors can begin replacing batteries in tractors and powering electric cars, scientists must generate materials to fabricate electrodes for bigger supercapacitors. To manufacture these storage devices, the United States now imports most of its activated carbon from Asia.

What has been done

Through a process developed for a project aimed at producing activated carbon for water purification, biochar was successfully converted into graphene. Biochar is a charcoal like material obtained from pyrolysis of dried distillers grain solids (DDGS) and other plant materials that are abundant in South Dakota. Graphene can be used in place of expensive, activated carbon to coat the electrodes of energy storage devices - supercapacitors.

Results

When biochar of DDGS is transformed into graphene, the yield is from 70 to 90% (based on biochar, e.g. 20%-36% based on DDGS). Therefore, a pound of DDGS costs 7.5 to 9 cents and converts to approximately 3-5.7 ounces of graphene, which currently worth at least \$75 (\$400/lb according to the lowest price of current industrial manufactured graphene) with processing cost

(cost of catalysts, labor, capital, transportation and management) less than \$10. In summary, the bio-renewable graphene preparation technique will not only benefit farmers and biofuel producers with additional income, but will also benefit our country's advanced carbon materials and advanced energy storage device industries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Subsurface Drainage Design and Water Management

Post workshop surveys with 16 respondents

Respondents reporting that workshops were useful or very useful:

- 100% - Design 1: Soil & Drainage Principles
- 88% - Legal Considerations of Drainage
- 100% - Design Session 2: Introduction to Design
- 63% - LiDAR Data
- 100% - Design Session 3: Comprehensive Design
- 94% - Design 4: Lift Station Design
- 69% - Software and sub-irrigation
- 81% - Safety
- 88% - Conservation Drainage Practices
- 100% - Design Session 5: Managed Drainage Design
- 88% - Wetland Delineations
- 87% - Design Session 6: Small Group Design Project

Key Items of Evaluation

Bio-Renewable Graphene Production

\$400 - Cost of one pound of graphene at the lowest price of current industrial manufactured graphene

\$53.28 - Cost of one pound of graphene when transformed from DDGS biochar plus all processing costs

Potential Return on Investment 651%

Subsurface Drainage Design and Water Management

Post workshop surveys with 16 respondents

Respondents reporting that workshops were useful or very useful:

88% - Average for all Workshops

99% - Average for Drainage Design (6 of 12 Workshops)

100% - Overall Entire Program

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food and Non-Food Products: Development, Processing, Quality, and Delivery

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
501	New and Improved Food Processing Technologies	0%		22%	
502	New and Improved Food Products	0%		32%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		4%	
504	Home and Commercial Food Service	80%		0%	
511	New and Improved Non-Food Products and Processes	0%		41%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	0%		1%	
703	Nutrition Education and Behavior	10%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	24.6	0.0
Actual Paid	2.6	0.0	28.8	0.0
Actual Volunteer	0.3	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
102496	0	501413	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
102496	0	519463	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct Research to Enhance the US Dairy and Food Industry
- Conduct Research on Co-products of Corn and Soybeans
- Research and Improve Biofuel Production Processes
- Develop Methods to Improve Acceptability of Fresh and Processed Meats
- Conduct BBQ Bootcamp Workshops
- Partner with South Dakota Beef Industry Council
- Partner with South Dakota Pork Producer's Council

2. Brief description of the target audience

- US Dairy Industry
- Farmers
- Biofuels Industry
- Beef Science Community
- Beef Producers
- Food Businesses
- Consumers

3. How was eXtension used?

SDSU Extension provided the project manager and Ask the Expert manager for DAIRYeXNET.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1494	3302243	1532	1462

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

Year: 2014
 Actual: 1

Patents listed

Method and System for Improving Yogurt Texture During Yogurt Manufacture

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	12	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Food and Non-Food Products: Development, Processing, Quality, and Delivery

Year	Actual
2014	10

Output #2

Output Measure

- Number of BBQ Bootcamp Workshops

Year	Actual
2014	6

Output #3

Output Measure

- Develop a Strong Research Program to Enhance the US Dairy and Food Industry

Year	Actual
2014	0

Output #4

Output Measure

- Extracted and Analyzed Oilseeds to Determine Biofuel Production Suitability

Year	Actual
2014	0

Output #5

Output Measure

- Conduct Research to Utilize Milk Components in Dairy Products

Year	Actual
2014	0

Output #6

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	139

Output #7

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	212

Output #8

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	1

Output #9

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	25

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Food and Non-Food Products: Development, Processing, Quality, and Delivery Hatch Research Projects
2	Number of BBQ Bootcamp Participants
3	Increase Knowledge of Structure-Function Relationships of Milk Proteins
4	Increased Knowledge for Obtaining Maximum Oil Yields
5	Increase the Potential to Expand Dairy Production in the United States

Outcome #1

1. Outcome Measures

Number of Food and Non-Food Products: Development, Processing, Quality, and Delivery Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The challenge today of producing enough food, fiber and fuel for more than 9.5 billion people by 2050 is almost daunting, especially because it needs to be done using less land, less water and less energy than is used today. Science driven technologies must be developed for this to be accomplished in a sustainable manner.

What has been done

Within the College of Agricultural and Biological Sciences, there are 15 Hatch projects that are categorized in the Planned Program of Food and Non-Food Products: Development, Processing, Quality, and Delivery. The research activities in this program are primarily supported by our Department of Agricultural and Biosystems Engineering, Department of Dairy Science, and our Department of Biology and Microbiology. Projects include but are not limited to the manufacture of new dairy food products, technologies for improving food safety, and the development of oilseed biofuels.

Results

Through research, we continue to build a scientific knowledge base to improve and understand food and non-food products.

Examples include:

The manufacture of modified milk protein concentrates to be used as ingredients in food products, improved health and nutrition benefits from dairy products, and the development of an oilseed based biofuel industry - biodiesel, bio-jet fuel, oil additives, and specialty lubricants that can help reduce our dependence on petroleum-based products. The biofuel industry also provides opportunities for agricultural diversification and rural sustainability in South Dakota. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
511	New and Improved Non-Food Products and Processes
512	Quality Maintenance in Storing and Marketing Non-Food Products

Outcome #2

1. Outcome Measures

Number of BBQ Bootcamp Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	350

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In recent years, there has been a lot of negative information surrounding meat products. Many times this information is incorrect and misleading, leaving the consumer grasping for answers. Consumers have expressed the need for trusted science-based information to base their decisions upon.

What has been done

SDSU Extension, partnering with the South Dakota Beef Industry Council and South Dakota Pork Producer's Council conducted six workshops in five cities. The workshops provided intensive, hands-on opportunities for consumers to enhance their understanding of meat cookery, barbecuing, smoking, food safety, meat selection, and nutrition.

Results

Participant evaluations indicate the workshops were very successful in educating consumers. The BBQ Bootcamp program greatly enhanced the understanding of cookery, selection, and safe handling of meat cuts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Increase Knowledge of Structure-Function Relationships of Milk Proteins

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Consumers are increasingly looking for dairy products with improved health and nutrition benefits. The structure and texture of a food product plays a huge role in how it is perceived by the consumer. Increased knowledge of protein structures may make it possible to tailor-make functional and nutritional properties in food products. Designing dairy products with these values will create new opportunities for the dairy industry and increase demand for dairy products.

What has been done

The research work was mainly focused to benefit the dairy industry in the South Dakota State, Midwest Region (research conducted through Midwest Dairy Foods Research Center) and the US as a whole. It is also anticipated the research outcomes generated from this project will be useful in improving the functionality of dairy products, manufacturing dairy and food products with clean label, will also help to design food production with better nutritional properties, which help to combat some pressing health issues currently faced by the USA and rest of the world e.g. obesity, healthy aging, weight management.

Results

Progress during this reporting period include three published peer-reviewed journal papers, one

invited book chapter/review published, three disclosures and provisional patent applications filed, and more than \$400,000 in competitive grants and contacts secured. Information has also been disseminated with invited and keynote presentations as well as oral presentations at national and international conferences. The program is also providing professional development for three undergraduate, one M.S. and two Ph.D. researchers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

Outcome #4

1. Outcome Measures

Increased Knowledge for Obtaining Maximum Oil Yields

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The global demand for energy threatens the economic stability of nearly every country in the world. The United States needs to develop a sustainable source of bioenergy and bio-based products. Oilseed crops have enormous potential for use in a variety of biofuel markets. The biofuels industry provides opportunities for rural economic growth while reducing our dependence on foreign oil.

What has been done

Nine varieties of oil seeds from harvest year 2012 and 11 varieties from harvest year 2013 were oil extracted using Accelerated solvent extractor (ASE 350) under the conditions of 100°C for a 90 min period. Hexane was used as a solvent. The oil yield, oil density and calorific values were measured. Partial project results have been presented at various regional, national and international meetings or conferences.

Results

From 2012, safflower had the most oil recovery followed by flax. Pennycress (Rose) had the maximum density. From 2013, flax showed the most potential for oil recovery followed by safflower and camelina. Flax showed maximum density in 2013. There was no significant difference in heating values of oils among all the oilseeds from different years. Two PhD graduate students are working on developing different protocols for oil extractions and characterizing the oil quality. The processing conditions of cold press and solvent extraction on carinata and camelina oil will be investigated next.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #5

1. Outcome Measures

Increase the Potential to Expand Dairy Production in the United States

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Protein is one of the most valuable components of milk. Today, the world demand for dairy protein exceeds the world supply. The U.S. dairy industry needs to identify and isolate valuable components of milk that can be converted into a variety of shelf stable products.

What has been done

Research was conducted on the manufacture of modified milk protein concentrates and their utilization as ingredients.

This includes evaluating the effectiveness of the modified functionality of the concentrates when used in process cheese products and the evaluation of new membrane materials during the production of whey protein concentrates. Research results were disseminated at seminars, presentations, and meetings.

Results

During this reporting period, accomplishments included several commercialization processes involving: micellular casein concentrate, galacto-oligosaccharide, hydrolyzed whey protein isolate, and mineral reduced milk protein concentrate that can be utilized in yogurt manufacture. Process improvement projects in conjunction with seven different companies were also conducted, as well as participation in symposiums, and more than 500 samples analyzed for the industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

BBQ Bootcamp

350 participants 55 respondents

Presentation

1 = not valuable; 10 = highly valuable

7.8 - Grilling, Smoking, Barbequing, Retail Selection

7.9 - Food Safety & Degrees of Doneness

8.5 - Spices, Rubs, & Marinades

Question

1 = absolutely not, 10 = absolutely; 1 = no knowledge, 10 = expert knowledge

8.6 - Did the speaker effectively explain the information?

5.6 - Knowledge level before program?

7.9 - Knowledge level after program?

9.3 - Was the program beneficial?

8.8 - Was the program beneficial in helping understand food safety, handling, and proper cooking temperatures for meat?

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Economics, Markets, and Policy

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	8%		9%	
602	Business Management, Finance, and Taxation	48%		13%	
603	Market Economics	38%		20%	
604	Marketing and Distribution Practices	0%		23%	
605	Natural Resource and Environmental Economics	4%		12%	
607	Consumer Economics	0%		10%	
608	Community Resource Planning and Development	2%		0%	
609	Economic Theory and Methods	0%		3%	
610	Domestic Policy Analysis	0%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.6	0.0	13.4	0.0
Actual Paid	6.1	0.0	12.7	0.0
Actual Volunteer	0.1	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
239158	0	125708	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
239158	0	134793	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analyze Supply Chain Management Strategies
- Analyze Farm Real Estate Market Developments
- Analyze Agricultural Commodity Prices
- Research Trends and Financial Risks
- Develop Marketing Strategy Recommendations
- Conduct Estate and Transition Planning Conferences
- Partner with the South Dakota Soybean Research and Promotion Council
- Conduct Ag Workshops

2. Brief description of the target audience

- Agricultural Commodity Groups
- Policy Makers
- Environmental Groups
- Farmers, Ranchers
- Producers
- Ag Land Owners
- Women in Agriculture
- Youth
- Agricultural Leaders

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8150	591192	293	1501

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

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	4	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Economics, Markets, and Policy

Year	Actual
2014	8

Output #2

Output Measure

- Number of Estate and Transition Planning Conferences During the Evaluation Period
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Ag CEO Workshops

Year	Actual
2014	1

Output #4

Output Measure

- Conduct Studies to Identify Product Attributes and Willingness to Pay for Locally Produced Beef

Year	Actual
2014	0

Output #5

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	16

Output #6

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	104

Output #7

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	1

Output #8

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	34

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Economics, Markets, and Policy Hatch Research Projects
2	Number of Family Farms or Ranches that Participated in Estate and Transition Planning Conferences
3	Number of Participants in the Ag CEO Program
4	Increased Understanding of Consumer Willingness to Pay for Locally Produced Beef

Outcome #1

1. Outcome Measures

Number of Economics, Markets, and Policy Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The economy is always changing and as new problems arise, research programs are needed to focus on the efficiency of crop and livestock sectors, sustainability of the food and fiber system, and rural development.

What has been done

Within the College of Agricultural and Biological Sciences, there are 10 Hatch projects that are categorized in the Planned Program of Economics, Markets, and Policy. The research activities in this program are supported by our Department of Economics. Hatch funded projects include but are not limited to research involving agricultural commodity prices, energy and the environment, agricultural land market trends, and the economic impacts on wildlife and crop production from biofuel production.

Results

Through research, our Department of Economics continues to build a scientific knowledge base to improve agricultural marketing and trade, farm and ranch management, and agricultural policies. Examples include:

Market studies for South Dakota produced beef, agricultural and international trade policy issues in the Northern Great Plains, commodity characteristic values of Hard Red Spring Wheat and vegetable oils, land markets and land management in South Dakota, and opportunities for cellulose based ethanol production in South Dakota. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

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
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics
609	Economic Theory and Methods
610	Domestic Policy Analysis

Outcome #2

1. Outcome Measures

Number of Family Farms or Ranches that Participated in Estate and Transition Planning Conferences

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of Participants in the Ag CEO Program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Whether producers are just beginning, changing roles, or already experienced, they face difficult times if they are not fully engaged in strategic planning of their business operations. To be a manager and CEO of today's farms and ranches, producers must have a solid foundation in financial management, and the ability to make decisions that will be profitable and work toward the long term goals of the operation.

What has been done

The Ag CEO program is an SDSU Extension signature program with emphasis on beginning farmers and ranchers. The program is a series of workshops and self-study, with additional training for producers completing Farm Services Agency (FSA) borrower training. The program uses a systems approach to farm business planning that includes topics in farm vision, resource inventory and management, and financial subjects including record creation and budget development and analysis. In addition, the Ag CEO program developed and conducted the Ag CEO Lender Conference in response to stakeholder's requests.

Results

Since the Ag CEO program started in the spring of 2012, 152 people have now taken part in the program. In this reporting period, 10 new farmers and ranchers participated. All 10 participants received Farm Services Agency (FSA) borrower training and all were able to renew their FSA loans. Everyone also completed a strategic plan specific to their operation, which included vision, SWOT analysis, GAP analysis, and scenario planning. One hundred and thirty people participated in the Ag CEO Lender Conference. The conference focused on land values and trends, production costs and price input outlook, grain commodity trends and outlook, macro-economic outlook, farm bill update, and cattle price outlook.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
603	Market Economics
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Increased Understanding of Consumer Willingness to Pay for Locally Produced Beef

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As producers increase efforts to meet the demand for locally produced food, demand-side information is needed to better understand the consumer's willingness to pay. This information is necessary to help producers develop efficient production and marketing strategies to increase profitability.

What has been done

In the last reporting period of this project, a study concluded that consumers were willing to pay higher prices for locally produced rib-eye steaks. In this reporting period, the focus has shifted to examine the effectiveness of social media at encouraging Millennial and Generation-X consumers to purchase more beef. On-line surveys and focus group interviews were conducted.

Results

The on-line survey of 126 respondents indicated that websites are the number one source for Millennial and Generation-X consumers to obtain nutritional information and recipes, followed by family and friends, magazines, and social media. The majority of respondents said nutrition and health were first priorities when considering buying beef but they also had misunderstandings of information that could potentially discourage more beef consumption. The findings suggest that there is a potential marketing opportunity for the beef industry to explore on-line and social media to promote beef consumption. The focus group interviews are being analyzed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Ag CEO

10 Participants

67% indicated they will increase their record keeping

50% will change how they keep electronic records

83% indicated they have now analyzed production practices and size, financial position, and natural resources and conservation

80% indicated they were now more confident in making decisions

40% now have written short-term and mid-term goals

20% now have long term written goals

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Human Nutrition, Food Safety, and Human 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
701	Nutrient Composition of Food	0%		5%	
702	Requirements and Function of Nutrients and Other Food Components	13%		42%	
703	Nutrition Education and Behavior	29%		39%	
704	Nutrition and Hunger in the Population	33%		1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	13%		4%	
723	Hazards to Human Health and Safety	0%		1%	
724	Healthy Lifestyle	12%		8%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	11.7	0.0	3.7	0.0
Actual Paid	11.3	0.0	5.0	0.0
Actual Volunteer	0.8	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
444150	0	178415	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
444150	0	183573	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Collaborate with Cheyenne Eagle Butte School Administration
- Conduct Research on Obesity in Rural Populations
- Conduct Research on Obesity and Chronic Diseases
- Conduct Research on Dietary Micro-Nutrients
- Research to Understand Nutrient-Gene Interactions
- Teach Food Safety Programs
- Distribute Fact Sheets
- Conduct Food Preservation Workshops
- Conduct Local Food Entrepreneur Programs
- Develop Nutrition and Physical Activity Curriculum
- Partner with the South Dakota Retailers Association
- Partner with the South Dakota Department of Health
- Develop and Enhance Community and School Gardens
- Conduct Workshops for the Aging and Senior Citizens

2. Brief description of the target audience

- Refugees from Asia and Africa
- Nutrition and Food scientists
- Health Educators
- Food Service Establishments and Employees
- Minority Audiences
- Food Entrepreneurs
- Consumers of Food Products
- Local Schools
- Youth
- Senior Citizens

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3412	2053550	2549	5374

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

Patent Applications Submitted

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	3	16	19

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Human Nutrition, Food Safety, and Human Health and Well-Being

Year	Actual
2014	7

Output #2

Output Measure

- Number of Home Food Preservation Workshops
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Food Entrepreneur Programs Conducted

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of Teens Trained as Teachers for KidQuest
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of Healthy Aging Presentations
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of Tatanka's Healthy Tales Activity Books Distributed
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of Senior Resource Fairs Presented
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of Intergenerational Bonds Presentations
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of Smart Choices Grocery Store Locations

Year	Actual
2014	7

Output #10

Output Measure

- Number of Food Safety Certification or Recertification Courses Presented

Year	Actual
2014	4

Output #11

Output Measure

- Number of Food Processing and Food Marketing Events

Year	Actual
2014	9

Output #12

Output Measure

- Number of Gerontology Events Presented

Year	Actual
2014	20

Output #13

Output Measure

- Number of Healthy Living Events that Created Learning Opportunities

Year	Actual
2014	23

Output #14

Output Measure

- Number of Garden Development or Enhancement Workshops and Webinars Conducted

Year	Actual
2014	12

Output #15

Output Measure

- Increase Quality of Life for Refugees in South Dakota

Year	Actual
2014	0

Output #16

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	123

Output #17

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	265

Output #18

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	0

Output #19

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	15

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Human Nutrition, Food Safety, and Human Health and Well-Being Hatch Research Projects
2	Number of Food Preservation Workshop Participants
3	Number of Food Entrepreneur Program Participants
4	Number of Schools that Completed the KidQuest Curriculum
5	Number of Healthy Aging Participants
6	Number of Children Reached through the Tatanka's Healthy Tales Activity Books
7	Number of Senior Resource Fairs Participants
8	Number of Intergenerational Bonds Participants
9	Number of Smart Choices Grocery Store Participants
10	Number of Participants that Completed a Food Safety Course
11	Number of Food Processing and Food Marketing Participants
12	Increase Knowledge of Aging Issues to Participants
13	Number of Participants Involved in Healthy Living Learning Opportunities
14	Number of Community or School Gardens Receiving Assistance with Development or Enhancement
15	Number of New Roots for New Americans Program Participants

Outcome #1

1. Outcome Measures

Number of Human Nutrition, Food Safety, and Human Health and Well-Being Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Obesity is a major concern within the United States and specifically within South Dakota. It is related to poor nutrition, the lack of physical activity and increased sedentary behavior. Obesity has been associated with increased risk for many chronic diseases. Obesity research in rural populations is lacking. To improve individual's health, scientific discoveries need to be found and translated to practice.

What has been done

Within the College of Agricultural and Biological Sciences, there are 8 Hatch projects that are categorized in the Planned Program of Human Nutrition, Food Safety, and Human Health and Well-Being. Research in this program is supported by our partnership with the College of Education and Human Sciences. Hatch funded projects include research involving dietary bioactive components, rural food environment, intervention to improve healthful behaviors in young adults, and dietary influences on obesity and chronic inflammation.

Results

Through research, we continue to build a scientific knowledge base to understand and improve nutritional sciences.

Examples include:

Understanding and preventing the underlying mechanisms of chronic diseases, dietary and physical activity behaviors of rural populations, behaviors that support healthful lifestyles in young adults, and determining the impact of dietary components. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
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
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of Food Preservation Workshop Participants

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of Food Entrepreneur Program Participants

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of Schools that Completed the KidQuest Curriculum

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of Healthy Aging Participants

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of Children Reached through the Tatanka's Healthy Tales Activity Books

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of Senior Resource Fairs Participants

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of Intergenerational Bonds Participants

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Number of Smart Choices Grocery Store Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Dakotans consume fewer fruits and vegetables than recommended for good health by the Dietary Guidelines. To improve produce consumption people need information on how to shop for and prepare fruits and vegetables. Educational materials on fruits and vegetables are most helpful if they are easy to use and available online or at the point-of-purchase.

What has been done

Through SDSU Extension and SDSU Health and Nutritional Sciences, the resource tool Pick It! Try It! Like It! was used at grocery stores to demonstrate shopping skills and resource management. Displays and sampling demonstrations were set up to increase consumer awareness and consumption of a wide variety of fruits and vegetables. SDSU Extension's online teaching platform iGrow, is also used extensively to distribute Pick It! Try It! Like It! materials.

Results

Approximately 1,000 shoppers received information for fruits and vegetables at the sampling demonstrations and an additional 8,500 nutritional information cards were distributed to other grocery stores, farmers markets and WIC clinics for display. Participants acquired factual information, healthy recipes and knowledge to improve their choices when purchasing food. As citizens become more educated about healthy eating, they are able to make positive choices to achieve good health and prevent or delay diet related diseases. The Pick It! Try It! Like It! program has grown and changed over the years in response to the needs identified by Extension and requests from stakeholders and partners.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #10

1. Outcome Measures

Number of Participants that Completed a Food Safety Course

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	55

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Center for Disease Control and Prevention (CDC) estimates that annually, 76 million people in the United States become sick with foodborne illnesses: 325,000 are hospitalized and 5,000 die each year. Foodborne illnesses are typically caused by improperly prepared food. In South Dakota, it is estimated that in 2012, there were 125,714 incidences of illness, 336 hospitalizations and eight deaths from food-borne illness.

What has been done

SDSU Extension Food Safety Field Specialist taught 4 Food Safety Foodservice Manager Certification and Recertification courses across South Dakota, including school food service personnel. One new teacher was identified in the south-central part of the state. She was trained and mentored by the Extension Field Specialist in teaching the class and coordinating with SD DOH and SDRA.

Results

Participants representing restaurants, schools, nursing homes and other food service establishments will adopt safe food handling practices, which lead to safe food served to individuals and families within the communities, minimizing the risk of food borne illness. A partnership continues with SD Retailers Association and the South Dakota Department of Health to meet food safety certification needs of South Dakotans. Following the training, food service managers are equipped with the knowledge and skills to train their staff members. Of the 55 trained at private classes, 78% received either their certification or recertification.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Number of Food Processing and Food Marketing Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	103

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Millions of Americans become ill each year from foodborne diseases. With an increase in home processed foods that are consumed by the processor or sold at local markets, there is the potential for an increase in foodborne illnesses. It is imperative that proper equipment, methods and laws are followed to prevent unnecessary illnesses and deaths from home processed foods.

What has been done

SDSU Extension participated in nine workshops throughout South Dakota to educate home food processors and entrepreneurs that want to sell home processed foods. The workshops were presented using the USDA Guidelines for Safe Home Food Processing. Social media, printed fact sheets and SDSU Extension's online teaching platform, iGrow were also used to disseminate food safety information. In addition, SDSU Extension's mentor program expands its outreach by training individuals to serve as food preservation mentors.

Results

Participants of SDSU Extension's food processing and food marketing programs increased their knowledge and gained confidence that they are practicing safe food guidelines and regulations. This gives consumers more control over the foods they eat and it adds value and profitability to the growers that choose to sell their foods at local markets. Twelve participants trained in the mentoring program have volunteered to serve as mentors across South Dakota; connecting people in communities with USDA recommended food preservation methods. There are currently 29 mentors in participating in the program. The more people that increase their knowledge of safe food processing, the more likely that food-borne illnesses will be reduced in South Dakota.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Increase Knowledge of Aging Issues to Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

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

2014

0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

By the year 2035, nearly 1 in 4 South Dakotans is projected to be over the age of 65. As the average age of the population increases, the number of individuals with disabilities is also projected to increase. Senior citizens and their families need access to educational information to help them live active and healthy lives in their homes and communities. Access to information can be especially limited in rural areas.

What has been done

In collaboration with SDSU Counseling and Human Development, SDSU Extension conducts educational events for its aging citizens in rural and urban South Dakota. The annual conference Aging: Healthy, Happy, and Wise had 94 participants attending breakout sessions that include: Fraud, Waste, and Abuse, Physical Activity, Optimum Health, The Basics of Pre-Planning Funerals and Living Wills. A separate program, TeachSD, is an intergenerational program to help adults develop technology skills. In its first year, ten youth have been trained to provide one-on-one technology training to adult learners.

Results

As a result of SDSU Extension's outreach efforts, senior citizens in South Dakota have more knowledge to help them maintain and improve their overall health, which increases their opportunities for independent living. Participants also have new sources for services and agencies of healthy aging consultation. This includes many seniors that could have easily been overlooked in rural communities. The youth involved in TeachSD gained knowledge on aging, and perspective on challenges that adults face as they learn new skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #13

1. Outcome Measures

Number of Participants Involved in Healthy Living Learning Opportunities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1209

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Obesity, poor nutritional habits, low levels of physical activity, and chronic diseases adversely affect the quality of life in South Dakota. The problem is not limited to adults; children in South Dakota have higher than average risks for obesity and diabetes. Risk behaviors for all ages need to be modified to prevent or greatly reduce the risk for developing health related problems and diseases.

What has been done

With its partners, SDSU Extension is involved in many programs that help create healthy living environments. Worksite Well-Being targets the health and well-being of the South Dakota workplace. Health Insurance Literacy provides decision making information for the Affordable Care Act. Better Choices, Better Health-SD addresses the impact of chronic diseases in the state. iGrow Readers helps educate children about the importance of healthy eating and physical activity. Community Walk Audits increase awareness and encourage support for walking and biking routes.

Results

By promoting a healthy living style to employees, businesses invest in their employees and help prevent chronic illnesses. This could result in reduced absenteeism and a more productive workforce, which may lower insurance premiums and increase profitability for the businesses. More than 20 community members across South Dakota attended training and became certified Master Trainers for chronic disease self-management. The Master Trainers will train other citizens that will become certified Lay Leaders that will then be able to co-facilitate the Better Choices, Better Health-SD workshops. After one year, it is expected that 250 people will have knowledge and training in chronic disease self-management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #14

1. Outcome Measures

Number of Community or School Gardens Receiving Assistance with Development or Enhancement

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	74

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As rural America keeps shrinking, there is a greater disconnect between our citizens and agriculture. At the same time, more people are in need of affordable, safe, and healthy foods. Research indicates that community gardeners, as well as youth that participate in gardening programs, include more fruits and vegetables in their diet.

What has been done

In response to educational requests, SDSU Extension has conducted workshops and activities involving horticulture, STEM, biodiversity, language arts, curriculum, food safety, nutrition, project management and grant resources. University credit was obtained by nine students. The Black Hills Garden Education Network was established to help

Results

Seventy-four community or school gardens have been launched, enhanced, or are in the development stage. The participants involved have learned valuable organization, development and horticulture skills that make them more self-reliant with their food production and consumption choices. Participants expressed confidence in themselves to launch and improve projects in their communities, providing more opportunities for food production and exposure to the amazing world of agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

Outcome #15

1. Outcome Measures

Number of New Roots for New Americans Program Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	38

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many of the refugees that have come to live in Sioux Falls, SD have an interest in growing their own food and for some, turning this production into an income source is also of interest. Barriers for this group include language, income levels, access to fresh fruits and vegetables, transportation, and land access. An incubator approach has the potential to help refugees gain knowledge of production in South Dakota as well as to assist with some of the start-up costs associated in launching a community garden and farmers market. It could ultimately help increase incomes and opportunity among low-income residents, increase access and potential consumption of healthy produce and create community among refugees as well as with the mainstream culture.

What has been done

In 2013 the Somali Bantu Community Development Councils of South Dakota acquired a Refugee Agricultural Partnership Program (RAPP) grant to assist aspiring, limited-resource refugees to develop their skills as growers, to encourage healthy diets and to sell their produce. Their funding helped to establish a community garden, program director and horticultural educator. SDSU Extension developed New Roots for New Americans, a 6-month intensive urban farming incubator program, providing refugee families with classroom and garden-based training. The 50+ hour multidisciplinary training program included gardening/horticulture, food entrepreneurship, food safety and preservation, food preparation, resource management, and nutrition. Participants also took field trips to commercial produce farms. SDSU Extension coached a small team of participants as they planned a farmers market at the community garden site. SDSU Extension wrote and administered a block grant to provide funding and to increase awareness of the farmers market.

Results

Thirty-eight refugee participants from Asia and Africa gained knowledge of sustainable produce production, food safety, nutritional information, canning, and local food entrepreneurship. All participants indicated the training was helpful and that they were successful growing a large supply of fruits and vegetables. As a result of the block grant, funds were provided to increase water access to the garden site, making it possible to expand from 12 to 102 raised beds. The grant also provided funding for display containers and tents that helped create a professional looking market - the New American Garden Market. Eighteen participants were vendors at the New American Garden Market. Overall, the participants indicated an improved quality of life and also reported that the program improved cultural interaction, creating new friendships.

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

According to the US Census Bureau, South Dakota has the top three counties in the nation with the highest poverty rates.

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Smart Choices Grocery Stores

An evaluation of individuals who shopped in grocery stores where materials were being used showed program recognition increased before and after implementation. Information obtained regarding shopping and food preparation habits will allow for further refining of materials. These materials, in addition to materials targeting youth and seniors, promote fruits and vegetables community-wide.

Food Processing and Food Marketing

Through knowledge and ability gained, participants have the confidence to make decisions and adopt safe food preservation behaviors to safely preserve food for their business and home. Of the participants that had never used a pressure canner, 100% gained confidence with using a pressure canner. Results indicated an increase in knowledge from 2.6 to 3.9 (out of 5) in technique for using a pressure canner and 2.8 to 4.2 (out of 5) in technique for using a boiling water bath canner. Understanding the pH level of various food products grew from 3.06 to 4.23 (out of 5).

Aging: Healthy, Happy, and Wise Conference

At the end of the conference, participants indicated their awareness in the following areas:

100% on fraud, waste, and abuse

90% on physical activity

100% on pre-planning funerals

91% on optimum health

93% on living wills

When the seniors were asked which areas they planned to utilize this new information within the next three months, the top two answers were physical activity and optimizing health.

New Roots for New Americans

Number of Participants - 38

100% - indicated the training was helpful and that they were successful producing food

48% - are interested in selling at more venues in the future

19% - are interested in expanding into an independent business in the future

77% - showed improvement in one or more food resource management practices

50% - showed improvement in one or more nutrition practices

72% - showed improvement in one or more food safety practices

5% - preserved produce through canning

67% - intend to preserve food by canning

90% - indicated having more food available

76% - are saving money on grocery bills

76% - are eating healthier

71% - are eating more fruits and vegetables

43% - have seen an increase in income from selling produce at the market

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Families, Youth and Communities

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
205	Plant Management Systems	3%		0%	
801	Individual and Family Resource Management	19%		100%	
802	Human Development and Family Well-Being	7%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	16%		0%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	6%		0%	
806	Youth Development	49%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	26.2	0.0	0.6	0.0
Actual Paid	36.6	0.0	0.7	0.0
Actual Volunteer	6.2	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
1434946	0	13993	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1434946	0	14704	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Research that Examines Financial Savings Behavior
- Build Community Capacity
- Conduct Activities on Native American Reservations
- Promote Financial Literacy
- Conduct Leadership Workshops
- Deliver Healthy Living Programs
- Conduct Workshops on Indian Reservations in Western South Dakota
- Conduct Character Education Program Training
- Develop and Enhance Community and School Gardens
- Partner with 21st Century Community Learning Centers

2. Brief description of the target audience

- Low to Moderate Income Families
- Rural Communities
- Entrepreneurs
- Youth
- Teenagers
- Native Americans
- Consumers of Food Products
- Local Schools
- Youth Program Leaders

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11627	1158115	28224	34908

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

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Families, Youth and Communities

Year	Actual
2014	1

Output #2

Output Measure

- Number of Communities Participating in the Book Read and Discussions
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Communities Hosting Small Business Beginnings Workshops
 Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of FCCLA Leadership Workshops Conducted

Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of Teens Trained in the Strong Bodies, Strong Futures, Teens as Teachers Program

Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Conduct Horticulture and Agriculture Workshops

Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of Character Counts School Trainings

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of Garden Development or Enhancement Workshops and Webinars Conducted

Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Conduct Activities that Build Community Capacity

Year	Actual
2014	0

Output #10

Output Measure

- Number of High School Students Selected as 4-H Hometown Hero Representatives

Year	Actual
2014	94

Output #11

Output Measure

- Implemented Evidence-Based Programs for Children, Youth and Families at Risk (CYFAR)

Year	Actual
2014	0

Output #12

Output Measure

- Create Financial Literacy Learning Opportunities

Year	Actual
2014	35

Output #13

Output Measure

- Number of Events Conducted on Native American Reservations

Year	Actual
2014	24

Output #14

Output Measure

- Number of Communities Hosting the Ripple Effect Mapping

Year	Actual
2014	3

Output #15

Output Measure

- Number of Teens Trained in the Teens as Teachers Program

Year	Actual
2014	27

Output #16

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	100

Output #17

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	395

Output #18

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	7

Output #19

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	25

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Families, Youth and Communities Hatch Research Projects
2	Number of Participants in the Book Reads and Discussions
3	Number of Small Business Beginnings Workshop Participants
4	Number of FCCLA Leadership Workshop Participants
5	Number of Students Taught by Strong Bodies, Strong Futures, Teens as Teachers
6	Number of Participants Graduating from Lakota Beginning Farmer and Rancher Development Program
7	Number of Teachers Trained to Use Character Counts
8	Number of Community or School Gardens Receiving Assistance with Development or Enhancement
9	Enhance Rural Community Sustainability in South Dakota
10	Number of Elementary Students Impacted by 4-H Hometown Hero Representatives
11	Number of Children, Youth and Families at Risk (CYFAR) Participants
12	Increase Family and Personal Financial Literacy to Participants
13	Number of Participants Involved in Native American Reservation Events
14	Ripple Effect Mapping Participants
15	Number of Students Taught by Teens as Teachers

Outcome #1

1. Outcome Measures

Number of Families, Youth and Communities Hatch Research Projects

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are concerns that the savings rate of American households, especially low and moderate income households is inadequate, leaving families extremely vulnerable to economic setbacks. Additionally, research indicates that there is a link between financial security and over-all health. Unhealthy families are not able to fully socially and economically contribute to their communities.

What has been done

Within the College of Agricultural and Biological Sciences, there is one Hatch project that is categorized in the Planned Program of Families, Youth and Communities. The research activity in this program is supported by our partnership with College of Education and Human Sciences. The Hatch funded project is research that involves psychological and behavioral factors that impact the decision to save. During this reporting period, one journal was published and data was collected for research involving student loan decision making.

Results

Through research, we continue to build a scientific knowledge base to improve and understand the sociological factors associated with personal finance. The results of a study that examined the link between behavioral life-cycle constructs and financial risk tolerance suggest that low-to-moderate households can benefit from financial education and commitment strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Number of Participants in the Book Reads and Discussions

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of Small Business Beginnings Workshop Participants

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of FCCLA Leadership Workshop Participants

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of Students Taught by Strong Bodies, Strong Futures, Teens as Teachers

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of Participants Graduating from Lakota Beginning Farmer and Rancher Development Program

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of Teachers Trained to Use Character Counts

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of Community or School Gardens Receiving Assistance with Development or Enhancement

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Enhance Rural Community Sustainability in South Dakota

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many young people are leaving rural South Dakota for opportunities in urban areas. When they do not return, there is a decline in the rural population that leads to a reduction in demand for services that help create jobs. Rural communities need access to resources and tools that attract people of all ages to live in their communities. Without the creation of opportunities, rural South Dakota will continue to see a decline in population.

What has been done

SDSU Extension's Community Development team works directly with many rural communities on one-time projects or with helping to build community capacity so they can continue programs

themselves. In one small town, SDSU Extension provided coaching to help keep a business from closing its doors. With the multistate project Marketing Hometown America, community facilitators are trained to conduct focus groups that lead to a marketing plan for their community. Also, efforts are underway to develop a food hub in the state, helping producers team up to sell locally grown products.

Results

With business planning and financial guidance from SDSU Extension, a small town's only full service restaurant has a new owner and is still open for business, helping to generate jobs and community spirit. Three rural South Dakota communities produced marketing plans empowering them to create a vision for growth while seeing itself in a new way. And by the fall of 2015, participants hoping for a new avenue to market the food they grow hope to have established the first food hub in South Dakota, creating much needed opportunities for the young farmers as well as the established producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #10

1. Outcome Measures

Number of Elementary Students Impacted by 4-H Hometown Hero Representatives

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With 82% of parents in South Dakota working, children are less supervised and parents often lack the tools or the time to teach character development. Today's youth are continually exposed to negative role models and high risk behaviors, leading to higher incidences of bad decision making.

What has been done

With the SDSU Extension Character Education Program, high school seniors are selected from their school as Hometown Hero representatives. As role models, the Hometown Heroes conduct classroom presentations and activities to elementary students based on trustworthiness and other character themes. The Hometown Heroes help the students build good character and leadership skills at an early age.

Results

Statewide - 8,807 elementary students from 60 schools in 26 SD counties heard the positive character message - Good Character is Right There Inside of You - from the Hometown Hero Representatives. Since the messages were presented by high school students from their own schools, the elementary students were left with a lasting impression of a true Hometown Hero that is a positive role model. Through a Hometown Hero teacher survey - teachers have reported that long after the students have been in their classrooms the elementary students are talking about what was said by the Hometown Hero representatives. There were also an additional 16,407 student views of the Good Character video message. Many 4-H parents and schools have asked that Hometown Heroes project be expanded to their schools.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #11

1. Outcome Measures

Number of Children, Youth and Families at Risk (CYFAR) Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	181

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The communities in Charles Mix and Roberts counties in South Dakota have high poverty rates, problematical school drop-out rates and challenging school environments. These risk factors can impact both family functioning and youth development outcomes.

What has been done

To address the needs of the youth and their families, a community team for each county is in place to help implement evidence-based programs, to build capacity for program implementation, and to plan for long-term community support and sustainability. The community-team approach supports the implementation of a family-based and a school-based evidence-based program.

Results

1) Strengthening Families Program 10-14 was attend by families in the Lake Andes and Sisseton communities. The SFP 10-14 program also expanded to 2 additional communities in SD beyond the two original CYFAR locations, totaling 9 communities with more in the planning stages.

Surveys were conducted at the final session for all participants. Of the survey items that pertain to the parent-child relationship, all items indicated an increase in positive parent-child interaction and relationship building experiences.

2) LifeSkills Training was instructed to all 7th graders in the Andes Central and Sisseton public school districts. The LST post tests indicated an increase in the use of positive life skills, drug refusal skills and positive assertiveness skills.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Increase Family and Personal Financial Literacy to Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	480

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Saving money continues to be a struggle for most Americans. Without personal or family budgets, citizens in South Dakota are very vulnerable to economic strain. Emergencies, high interest credit, and unhealthy spending all lead to the risk of poverty, which increases the burden of health and

welfare for local, county, and state governments.

What has been done

In partnership with the SDSU Department of Consumer Sciences, SDSU Extension promotes financial literacy through its family and personal finance programs. During America Saves Week, participants were encouraged to strategize their spending and set goals using the SD Saves Campaign. Growing Financial Wellness is a webinar based program developed on the basis of a study that shows personal finance problems have a direct negative affect on their employer's profitability. Youth Financial Literacy targets youth prior to high school with programs and activities carried out with SDSU Extension 4-H Youth Advisors.

Results

With its family and personal finance programs, SDSU Extension reached more than 480 individuals at 35 events. Not only do the participants have a better chance for increased financial capability and capacity, but the public benefits through less reliance on public assistance programs. It is also reasonable to assume that with improved financial capability of the citizens, employers in South Dakota will see an increase in work productivity, less work accidents, and healthier employees. By engaging our youth at a very young age, we lessen the risk of poverty spanning for generations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #13

1. Outcome Measures

Number of Participants Involved in Native American Reservation Events

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	407

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Populations continue to increase on South Dakota reservations, but access to nutritious food continues to be an issue in many areas. There are few grocery stores accessible to many communities. Access to food is often limited to convenience stores which have very little fresh food available. There has been a surge of interest in gardening and other agricultural programs over the past several years, as well as an interest in small business and entrepreneurial opportunities.

What has been done

Through its partnerships, SDSU Extension has Federally Recognized Tribal Extension Program offices at Cheyenne River, Pine Ridge and Rosebud Reservations. Nutrition Assistants, 4-H Program Advisors, and Field Specialists all provide leadership and outreach activities to the Native American communities. In collaboration with its partners, SDSU Extension conducted workshops in gardening, food preparation and preservation, nutrition, farmers markets, financial literacy, and also held small acreage and rancher workshops.

Results

Locally produced food is becoming increasingly available in South Dakota's reservation communities. Two new community gardens and three new school gardens were started in this reporting period, and more than 40 individuals were trained in beginning gardening - resulting in at least 15 home gardens. The interest in commercial food production on reservations increased with participants seeking and gaining knowledge of farmers markets and food hubs as marketing strategies. More than 300 youth engaged in nutrition education and food preparation classes. And more than 30 ranchers and small acreage producers increased their knowledge of commercial agricultural production. Fourteen participants were trained as Master Gardeners. Meetings were held to plan for future high tunnel programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
806	Youth Development

Outcome #14

1. Outcome Measures

Ripple Effect Mapping Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	36

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The three communities participating in the Marketing Hometown America requested information on how they can demonstrate progress to their communities. Concurrently, SDSU Extension's Community Development program was interested in a participative model for evaluation of its community projects.

What has been done

SDSU Extension participated with 3 communities using the evaluation method as part of the Marketing Hometown America - Ripple Effect Mapping. Ripple Effect Mapping engages participants to visually map and understand the intended and unintended results of programming. Like the ripple effect of throwing a stone in the water, each ripple answers a question, ultimately leading to the discovery of the changes in the community as a result of the program.

Results

Ripple Effect Mapping proved to be a very effective tool for communicating with each community. The method demonstrated to all participants that they had big accomplishments and made great progress. Participants were able to see that they were making positive changes in their communities along with positive changes in community attitudes. Some communities reported an increase in outside funding and volunteers became more active. SDSU Extension has included Ripple Effect Mapping in several grants for future community engagement projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #15

1. Outcome Measures

Number of Students Taught by Teens as Teachers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	230

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bullying and fighting can happen anywhere. In South Dakota, according to a 2013 survey, 26% of high school students had been bullied and 24% had been in a physical fight. The same survey by the SD Department of Health, also reported that 17% had been bullied electronically. Youth programs are needed to help prevent bullying and fighting.

What has been done

SDSU Extension helped create learning communities by partnering youth with 21st Century Community Learning Centers and local school districts. The Teens as Teachers program was used to enhance 4-H youth development through service learning projects that are planned and carried out by teens. The program gives youth the opportunity to make a difference in their communities and schools. Community events by the teens increased awareness about bullying.

Results

Youth of all ages, whether it was the teen teachers or the elementary students learning from the teens, all learned valuable lessons about bullying and conflict resolution. Elementary students reported that they learned how to respect others and their cultures and not to bully. The teens reported that they better understand bullying and the consequences from it. The teens also acquired critical life skills including responsibility, time management, confidence, and the ability to work well with adults. The teens also gained first-hand experience as teachers in a classroom.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

According to the US Census Bureau, South Dakota has the top three counties in the nation with the highest poverty rates.

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Children, Youth and Families at Risk (CYFAR)

Evaluation of each component of the CYFAR project was completed.

- 1) Strengthening Families Program 10-14 participants completed a retroactive pre/post evaluation at the conclusion of the program.
- 2) Students participating in LifeSkills Training completed a standard pre and post-test process. The LifeSkills Training pre and post-tests analyzed the knowledge and skills gained by students using true or false and 5 point Likert scale questions on anti-drug attitudes and various life and resistance skills.
- 3) Utilizing previous surveys of community team members, technical assistance was provided by the prevention coordinator and state management team as appropriate. This year was a primarily focused on preparation for sustainability of the programs following grant funding.

South Dakota Saves Campaign

There were a total of 29 participants who pledged to save over \$75,000 toward their personal savings goals. By having individuals complete small savings strategies, it allowed them to look at ways they can save money every day. The goal is to get individuals thinking of how they can save money without having to make a drastic change to their way of life. The following strategies were completed by participants in the month of February:

- 57% Only purchase items with cash today so you become more mindful of what you spend.
- 63% Save your change today.
- 50% Buy in bulk and repackage if it means larger savings.
- 27% Place a visual reminder for your short term financial goal where you can see it regularly.
- 43% Cook a meal from scratch and calculate the savings compared to convenience foods.
- 47% Track all of your spending today (no matter how small).
- 40% Use the grocery store weekly ad to plan meals for the next week.
- 67% Try a free/low cost activity for tonight's entertainment.
- 43% Determine your short, intermediate, and long-term financial goals for

yourself/family.

- 70% Complete your weekly errands in one trip.
- 93% Take a reusable water bottle rather than buying bottled water.
- 53% Check your phone plan(s) to see if you can cut costs to save.
- 77% Buy more generic foods at the grocery store.
- 73% Bring a soda from home instead of buying from a vending machine or convenience store.
- 37% Check your cable bill to see if there is a way to cut costs and save.
- 43% Add savings to your monthly budget as an expense.
- 63% Turn the thermostat down 2 degrees.
- 97% Turn the water off when you brush your teeth.
- 80% Turn your computer off at night.
- 93% Turn lights off when no one is in the room.
- 57% Unplug chargers for electronics when not in use.
- 57% Skip the movie theater and rent a movie or borrow one from your local library.
- 27% Review your insurance policies and ask your agent if there are ways to reduce your cost.

Growing Financial Wellness

The following results are based on evaluations conducted with participants (N=49) using a retrospective pre-post survey (5-point Likert Scale 1=Know Nothing to 5=Know a Lot).

Participants who attended sessions on personal finance basics increased knowledge from a mean score before the session of 3.74 to 4.49 after attending the session.

Participants who attended sessions on retirement planning increased knowledge from a mean score before the session of 2.53 to 4.09 after attending the session.

Participants who attended sessions on health and aging increased knowledge from a mean score before the session of 3.74 to 4.63 after attending the session.

Participants who attended sessions on managing risk increased knowledge from a mean score before the session of 3.21 to 4.69 after attending the session.

A 3-month follow-up evaluation was conducted with participants to determine if any positive financial behavior had been adopted because of participation in the program:

- 41% who attended a credit session printed a copy of their free credit report.
- 68% who attended a retirement session estimated the amount of money needed at retirement.
- 67% who attended a budget session created a budget/spending plan.
- 68% who attended a session on Flexible Spending Accounts & Health Savings Accounts indicated they evaluated their current contributions to see if an adjustment needed to be made.

Ripple Effect Mapping

Ripple Effect Mapping revealed 6 impact themes:

- Leadership Development: Community members stepped into new leadership roles within the community
- Amenities: Enhancements were made to community assets as part of the marketing plan actions
- Engagement (including Youth): The people, including youth identified a new level of ownership in community activities and became involved in new ways.
- Marketing: Branding, promotion, social media, videos and other types of marketing were developed as a result of the Marketing Hometown America process

- Networking: Organizations partnered in new ways to benefit the communities
- Civic Awareness/Community Spirit: For the residents involved in the program, an increase in the awareness of the community activities and actions lead to what can be referred to as more community spirit.

Key Items of Evaluation

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.