

2017 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 essential 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 Extension regional centers operating across the state with Extension 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 portion of South Dakota. 4-H Youth Development begins on campus with the South Dakota State 4-H Office and has 4-H Extension field specialists in Extension regional centers and 4-H youth advisors in county-owned offices. SDSU Extension's online teaching platform, iGrow.org, had 572,836 users. The reported number of users decreased in comparison to last year's report due to a change in how Google calculates users for user metrics. The usage of iGrow.org has grown substantially since 2011 from 278,439 to 1,254,544 pageviews in 2017. Facebook continues to be a useful marketing tool for SDSU Extension, generating 93.73% of social referrals site wide. The primary audience of iGrow is in South Dakota and the United States, but content is viewed in 215 countries around the world.

South Dakota State University uses the following Planned Programs in its Combined Research and Extension Plan of Work. 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. Hatch funded projects include but are not limited to research studies involving the consequences to soil from climate and land-use changes, risk analysis of water resources, environmental impacts on grasslands, climate variability, the impact on crops from Canada geese, watershed management, soil productivity, bioenergy, wildlife habitat, pollution prevention, and range management. Activities for SDSU Extension in this Planned Program involve grassland management, wildlife habitat development, no-till, corn and soybean nitrogen recommendations, soils management, and Concentrated Animal Feeding Operations.

Plants and Their Systems

The research activities in this program are primarily supported by our Department of Agronomy, Horticulture, and Plant Science, and our Department of Biology and Microbiology. Hatch funded projects include but are not limited to research studies in genetically modified corn, soil-borne plant pathogenic fungi and other crop pests and diseases, seed traits in grass species, nitrogen fixation, oat breeding,

nodule development in soybeans, crop genetics and genomics, perennial grasses for bioenergy, grapevine mapping, improved alfalfa production, and best management practices for carinata, camelina, and flax. Activities for SDSU Extension in this Planned Program involve sorghum production, agronomy field schools, cover crops, alfalfa growth and production testing, utilization of field peas in South Dakota, 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 and Food Science, and our Department of Veterinary and Biomedical Sciences. Hatch funded projects include but are not limited to research studies to improve health and performance in dairy cattle, epidermis repair of food animals, pre-harvest management of beef cattle, co-product feeds for sheep, milk production management for dairy cattle, vaccines for viral diseases, and reproductive efficiency in cattle. Activities for SDSU Extension in this Planned Program involve the establishment of a partnership with Puerto Rico to recruit dairy workers, artificial insemination schools, the enhancement of a sustainable dairy community through a multistate collaboration, mineral nutrition in cattle, sheep production, animal welfare, heifer development, and the Calf Value Discovery program.

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 activated carbon for water and blood purification, lignocellulosic based bio fuel, and the development of microorganisms to facilitate composting of plant materials. Activities for SDSU Extension in this Planned Program include land use and management practices to enhance water quality, feedlot development, calving barns, and lambing facility ventilation.

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 and Food Science, and our Department of Biology and Microbiology. Hatch funded projects include but are not limited to emerging technologies in dairy manufacturing, conversion of lignocellulosic biomass into advanced liquid biofuels, the manufacture of new dairy food products, technologies for improving food safety, and the development of oilseed biofuels. Activities for SDSU Extension in this Planned Program include beef carcass fabrication, meat cookery, Meat Science Expo, and 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 the economics of a bio-based industry, price behaviors of agricultural commodity derivatives, enhancing rural sustainability and quality of life, market studies for South Dakota produced beef, agricultural land market trends, and economic impacts of agricultural trade policies. Activities for SDSU Extension in this Planned Program involve ag land values, economics of conservation, risk and business management, commodity marketing, and costs of crop production.

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 research involving functionality traits of wheat dough, dietary bioactive food components, rural food environment, intervention to improve healthful behaviors in young adults, and dietary influences on obesity and chronic inflammation. Activities for SDSU Extension involve nutrition, healthy eating, physical activity, worksite wellness, food preservation, chronic diseases, community gardens, and gerontology.

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 financially. Activities for SDSU Extension involve 4-H Youth Development, women in agriculture, estate and transition planning, family financial wellness, Native American events, rural sustainability, and building community capacity.

NOTABLE ACHIEVEMENTS

New Enzyme-Based Cleaner Formulation for Membrane Biofilms

A new combination of enzymes based cleaner was formulated and tested for its efficacy in collaboration with a leading cleaning solution provider for the dairy industry. It was found to help extend the functional life of dairy separation membranes.

Reduced Fouling with Modified Stainless Steel Surfaces

Stainless steel coatings of plate heat exchanger demonstrated its lower biofouling during long pasteurization processing times in a pilot scale trial. Such coatings can help extend the continuous processing time in dairy operations, and improve the microbial quality of processed products.

New Instruments Assess Healthfulness of Campus Environment

SDSU researchers working with a multi-state group have initiated the development of instruments to assess the dining, vending, food access, recreational facilities, and the physical environment on campus. They can be used to develop a healthy campus index to provide feedback to stakeholders to improve the healthfulness of their environments and reduce the proportion of young adults to become obese and thus chronic disease.

Dough Baking Performance

Investigators discovered the correlation of dough's ability to stretch to the stability of the air cell walls. This simplifies the process for wheat breeders to identify which varieties have better baking potential. What once took 11 equations to calculate, now takes one, saving valuable time for wheat breeders.

Creation of Economical Processing Methods

Investigators are focused on creating economical processing methods that enhance the nutritional value of sustainable, plant-based meals and enable replacement of marine-derived proteins in animal feeds.

Water Quality Impacts

Research results showed that water quality impacts were not statistically different for winter-applied manure whether it was applied to the upper half of the watershed or the lower half of the watershed. This allows winter manure application, giving the producer much more flexibility and removes or reduces the need to stockpile manure.

Pollinators Increase Yield

Results by researchers show pollinators increase yield in the experimental oil crop Brassica carinata. Carinata yield increases with higher insect diversity and increases nearby honey bee hive health.

Oat Breeding

In this reporting period, 234 new unique cross combinations were made. Two new lines will potentially be released in 2017 and 2018 that are high yield and have disease resistant qualities. This could result in approximately 20 bushels more per acre than that of other SDSU varieties in areas where crown rust is prevalent and when no fungicide is applied. With a value of \$2.50 per bushel, this equates to an advantage of \$50 per acre.

Peer-Reviewed Publications

Number of peer-reviewed publications for 2017:
South Dakota Ag Experiment Station -182

SDSU Extension - 29

Master Gardeners

SDSU Extension Master Gardeners contributed nearly 11,400 hours to community horticulture education, a value of \$231,000, with over 280 events statewide. In this reporting time-frame, 58 new Extension Master Gardener Interns were added to the roster of active participants in the program.

Pesticide Management Program

Almost 5300 individuals were reached through 66 Integrated Pest Management training events held throughout South Dakota. Participants increased their knowledge of pest biology, disease identification, pesticide label interpretation, pesticide handling, and environmental factors.

Strengthening Businesses

Educational opportunities were held statewide to help communities create an environment that's favorable to entrepreneurship growth. Through the facilitation of three different programs, a total of 167 individuals participated in 18 locations.

Community Food Systems

SDSU Extension provided learning opportunities and programs statewide to strengthen community food systems. Efforts included 130 participants attending the SD Local Foods Conference, 200 individuals attending the Native American Beginning Farmer Rancher Development Program's hands-on workshops, and Voices for Food in 4 rural communities with high poverty rates

4-H Robotics

During 2017, South Dakota 4-H had 838 youth enrolled in the robotics project area with 25 4-H volunteers providing 2,506 hours of robotics opportunities. The project supports the development of science, technology, engineering, and math (STEM) literacy and builds a variety of 21st Century skills within youth

South Dakota Dairy

A Dairy Fest event was held with 5 activities implemented to promote public support and increase awareness of the SD dairy industry. Almost 2,000 participants and 100 volunteers participated.

Annie's Project

In South Dakota, women are vital to agriculture. As a result of Annie's Project, 89 women are more knowledgeable partners in their farm and ranch businesses. The program provides an environment for women to learn and network with other women involved in agriculture.

Gerontology

An Aging Gracefully Expo (AGE) took place via webcast in 4 of the 5 participating communities. AGE activities impacted 500 individuals dealing with aging and senior citizens.

Pesticide Applicator Training Sessions

Commercial and private applicator training sessions were held statewide in South Dakota with almost 4,900 total participants. Participants enhanced their knowledge and understanding of safe and sustainable methods to apply pesticides.

Planned Programs Staff Effort Summary

This explains how much of each program is associated with each knowledge area.

South Dakota Agricultural Experiment Station (Hatch Research)

1. Natural Resources and Environment - 27%
2. Plants and Their Systems - 20%

- 3. Animals and Their Systems - 27%
- 4. Agricultural, Natural Resource and Biological Engineering - 4%
- 5. Food and Non-food Products, Development, Processing, Quality and Delivery - 10%
- 6. Economics and Market Policy - 5%
- 7. Human Nutrition, Food Safety, and Human Health and Well-Being - 5%
- 8. Families, Youth and Communities - 2%

SDSU Extension (Smith-Lever 3(b)(1) and (c))

- 1. Natural Resources and Environment - 5%
- 2. Plants and Their Systems - 9%
- 3. Animals and Their Systems - 16%
- 4. Agricultural, Natural Resource and Biological Engineering - 7%
- 5. Food and Non-food Products, Development, Processing, Quality and Delivery - 1%
- 6. Economics and Market Policy - 6%
- 7. Human Nutrition, Food Safety, and Human Health and Well-Being - 14%
- 8. Families, Youth and Communities - 42%

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	108.0	0.0	167.0	0.0
Actual	107.5	0.0	183.8	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 Vitality
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. 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, e.g., ag producers, or specific sub-audiences such as 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 with stakeholder and constituent groups. Program Directors share summaries specific to the capstone program area with department heads, faculty and specialists during program meetings. Stakeholder input is reviewed, considered and used as a basis to create SDSU Extension programs and AES research projects.

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. Stakeholder input is reviewed, considered and used as a basis to create SDSU Extension programs and AES research projects.

IV. Expenditure Summary

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

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	2302477	0	3857078	0
Actual Matching	2302477	0	3857078	0
Actual All Other	0	0	0	0
Total Actual Expended	4604954	0	7714156	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	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	31%		16%	
103	Management of Saline and Sodic Soils and Salinity	0%		4%	
104	Protect Soil from Harmful Effects of Natural Elements	1%		0%	
111	Conservation and Efficient Use of Water	4%		2%	
112	Watershed Protection and Management	0%		13%	
121	Management of Range Resources	14%		14%	
131	Alternative Uses of Land	4%		1%	
132	Weather and Climate	5%		8%	
133	Pollution Prevention and Mitigation	11%		0%	
134	Outdoor Recreation	2%		1%	
135	Aquatic and Terrestrial Wildlife	0%		22%	
136	Conservation of Biological Diversity	6%		9%	
141	Air Resource Protection and Management	12%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	6.5	0.0	36.7	0.0
Actual Paid	5.4	0.0	49.6	0.0
Actual Volunteer	1.4	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
115124	0	1041411	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
115124	0	1041411	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
- Participate with the South Dakota State Climate Office
- Conduct Training for Concentrated Animal Feeding Operations
- Partner with the South Dakota Department of Environment and Natural Resources
- Partner with the Natural Resources Conservation Service

2. Brief description of the target audience

- Wildlife and Fisheries Managers
- Scientists
- 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3716	609845	98	0

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

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	3	26	29

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	27

Output #2

Output Measure

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

Year	Actual
2017	1

Output #3

Output Measure

- Number of CAFOs Participants

Year	Actual
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2017 99

Output #4

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	9

Output #5

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	40

Output #6

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	1

Output #7

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	51

Output #8

Output Measure

- Create Soil Health Learning Opportunities

Year	Actual
2017	1

Output #9

Output Measure

- Conduct Field Research to Determine the Effectiveness of the Canada Goose Damage Program
Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Research Climate Variability and Management Impacts on South Dakota Grasslands

Year	Actual
2017	1

Output #11

Output Measure

- Research Environmental Impacts on South Dakota Grasslands

Year	Actual
2017	1

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

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 involving the consequences to soil from climate and land-use changes, risk analysis of water resources, environmental impacts on grasslands, climate variability, the impact on crops from Canada geese, watershed management, soil productivity, bioenergy, wildlife habitat, 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:

Best management practices to protect soils, reduction of nitrates in drainage water, streamflow trends under climate variability, 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
103	Management of Saline and Sodic Soils and Salinity
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
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
134	Outdoor Recreation
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
2017	71

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 560 student ranchers since 2003. Students participated in classroom presentations as well as hands-on field activities. The topics covered include plant identification, wildlife habitat development, prescribed burning, and ecological sites and soils.

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. By targeting many of the events to youth, SDSU Extension continues to help conserve South Dakota's fragile rangelands.

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
2017	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 a CAFO Environmental Training Program. The South Dakota General Permit for CAFOs was reissued in 2017, requiring all current permit holders to reapply for permit coverage in the next four years.

What has been done

SDSU Extension, the South Dakota Department of Environment and Natural Resources (SD DENR), and the Natural Resources Conservation Service (USDA-NRCS) provide training two to 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. In FY2017 there were two training sessions. Paper-based exit surveys were distributed and collected at the end of the Environmental Training Programs to gauge change in knowledge and application of information.

Results

For the CAFO Environmental Training Programs provided, approximately 78% of the participants were required to be at the training sessions and the remaining 22% attended for the learning experience. Many of those attending for the learning experience represented county planning and zoning boards or offices. The session participants from livestock operations represented over 40,000 animals in the beef industry, 58,200 dairy cows, over 100,000 pigs, and 850,000 poultry. Survey results showed a 19% to 46% increase in the overall understanding of the topics and an 81% overall satisfaction rate with the program. Over 71% 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
2017	695

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

The primary research focus of the soil fertility management team has been recalibration of the corn nitrogen recommendations, nitrogen timing for wheat and corn, micronutrients for corn and soybeans, and evaluation of soil micro-biological amendments. Soybean phosphorus recommendation recalibration was finished and results showed no major changes to our current recommendations. Educational presentations at crop clinics and field days were made to increase the knowledge of many producers and agronomist.

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. Twelve articles were written and posted on the iGrow learning platform.

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
2017	1

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

The distance from water which geese would travel to eat soybeans after the areas near the wetland was treated with anthraquinone was evaluated. Upon completion of a student thesis, recommendations will be provided on the concentration of anthraquinone needed, the distance into the field water to apply, and effects of the chemical on soybean yield. Journal articles will be published from the thesis.

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
2017	1

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. Clipping, fire, and nitrogen treatments were applied 2016. Rainout shelters that simulated a drought with 50% reduction in rainfall was established on three ranch demonstration sites.

Results

During this reporting period, this study demonstrated that:

- 1-Clipping and fire have similar effects on manipulating prairie vegetation
- 2-Frequency of treatment shows exotic cool-season grass species are resilient to disturbance
- 3-simulated increased nitrogen deposition appears to have minimal impact of community plant composition

The rainout shelters and spring defoliation treatments will be repeated in 2017.

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Concentrated Animal Feeding Operations Training Program
Post-workshop Surveys
86 of 99 Participant Responses
81% - Overall Participant Satisfaction with the Program

Understanding of the Topic before Program (average for two training session)
68% - Water Quality
57% - Permit
75% - Land Application
68% - Worksheets
67% - Conservation
57% - Nutrition
64% - Air Quality

Understanding of the Topic after Program
87% - Water Quality
83% - Permit
90% - Land Application
86% - Worksheets
88% - Conservation
82% - Nutrition
83% - Air Quality

Participants that Have Already Adopted Practices (average for two training sessions)
68% - Land Application
43% - Conservation
40% - Nutrition
43% - Air Quality

Percentage of Remaining Participants that Plan to Adopt Practices

82% - Land Application
82% - Conservation
71% - Nutrition
79% - Air Quality

Key Items of Evaluation

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%		33%	
202	Plant Genetic Resources	0%		7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	5%		2%	
205	Plant Management Systems	20%		8%	
206	Basic Plant Biology	12%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	23%		4%	
212	Pathogens and Nematodes Affecting Plants	9%		12%	
213	Weeds Affecting Plants	8%		1%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	0%		1%	
215	Biological Control of Pests Affecting Plants	0%		2%	
216	Integrated Pest Management Systems	22%		8%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	10.8	0.0	46.8	0.0
Actual Paid	9.7	0.0	36.8	0.0
Actual Volunteer	8.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
207223	0	771415	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
207223	0	771415	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

- Develop Improved Oat Cultivars
- Collaborate with Master Gardeners
- Develop Improved Wheat Cultivars
- Conduct Research on Economic Impacts of Fungal Diseases
- Develop Superior Sunflower Germplasms
- Develop New Cultivars of Prairie Cordgrass for Bioenergy Production
- Analyze and Map Genes for Soybean Resistance of Aphids
- Conduct Pesticide Applicator Training Sessions
- Deliver Integrated Pest Management Resources
- Partner with the South Dakota Agri-Business Association

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	55230	3697299	9087	33006

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

Patent Applications Submitted

Year: 2017
 Actual: 2

Patents listed

- 1. Surpass (Wheat PVP)
- 2. Boost (What PVP)
- 1. Surpass (Wheat PVP)
- 2. Boost (What PVP)
- Surpass (Wheat PVP)
- Boost (What PVP)

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	17	17

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	20

Output #2

Output Measure

- Number of Pesticide Applicator Training Sessions

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

2017 1

Output #3

Output Measure

- Number of Master Gardener Training Sessions

Year	Actual
2017	1

Output #4

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	48

Output #5

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	232

Output #6

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	3

Output #7

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	57

Output #8

Output Measure

- Conduct Research for Improved Oilseed Production
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of Integrated Pest Management Training Events Conducted

Year	Actual
2017	1

Output #10

Output Measure

- Conduct Research on Spring Wheat Cultivars
Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Conduct Research on Oat Cultivars
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Plants and Their Systems Hatch Research Projects
2	Number of Pesticide Applicator Training Participants
3	Number of Participants Completing Master Gardener Training
4	Number of Integrated Pest Management Participants
5	Increase Oilseed Crop Knowledge and Productivity and Profitability
6	Release Spring Wheat Cultivars

Outcome #1

1. Outcome Measures

Number of Plants and Their Systems Hatch Research Projects

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	36

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 Agronomy, Horticulture, and Plant Science, and our Department of Biology and Microbiology. Projects include but are not limited to research studies in genetically modified corn, soil-borne plant pathogenic fungi and other crop pests and diseases, seed traits in grass species, nitrogen fixation, oat breeding, nodule development in soybeans, crop genetics and genomics, perennial grasses for bioenergy, grapevine mapping, improved alfalfa production, and best management practices for carinata, camelina, and flax.

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:

Prevention of pollination contamination in maize, engineered cyanobacteria to produce biofuels and commodity chemicals, new releases of oat and wheat cultivars, the development of high yield, pest resistant sunflower, oil extraction from oilseeds for biofuel production, soybean plants that produce more of its own nitrogen, and improve efforts to extend carbon assimilation of switchgrass. 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	Pathogens and Nematodes Affecting Plants
213	Weeds 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
2017	4897

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 4897 people attended 99 training events in 2017, which included research farm tours, pesticide recertifications, commercial applicator sessions, workshops, field tours, and crop consultants updates.

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 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
2017	58

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Master Gardener programs are volunteer-based programs that train individuals in the science and art of gardening to promote gardening, to inform the public about current horticulture practices, to enhance environmental conservation, and to broaden communities' gardening expertise.

What has been done

During 2017 there were 24 Master Gardener training sessions with 72 participants. A total of 58 individuals completed their Master Gardener certification. In exchange for their Master Gardener Certification training, 58 Master Gardener program participants will share their time and knowledge about current, research-based, consumer horticulture information within 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.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

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
2017	5294

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 5294 people attended 66 training events in 2017, which included research farm tours, pesticide recertifications, workshops, field tours, and crop consultants' updates. More than 8,100 people visited SDSU Extension's

traveling displays. The SDIPM Program also worked with the SD Bureau of Indian Affairs on noxious weeds in tribal grounds to make their prairie more productive and healthier for the animals that graze.

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. In the long run this also helps to reduce pesticide applications and amount of pesticides used.

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

Not Reporting on this Outcome Measure

Outcome #6

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
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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

Two experimental lines were considered for release in 2017. An illustration of economic impact, which results from genetic gain, can be developed through comparing the performance of Boost and Surpass with the performance of 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 2014 through 2016, both Boost and Surpass produced approximately 5.2 more bushels of grain per acre than Briggs. At a market value of \$5.00 per bushel, this equate to an advantage of \$26.00 per acre that is available to growers that choose to plant the new cultivars as opposed to continually growing Briggs. Although both consistently produce more grain than Briggs, they were largely released for their elevated levels of disease resistance.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

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	20%		9%	
302	Nutrient Utilization in Animals	23%		25%	
303	Genetic Improvement of Animals	6%		4%	
304	Animal Genome	2%		1%	
305	Animal Physiological Processes	0%		7%	
306	Environmental Stress in Animals	4%		0%	
307	Animal Management Systems	6%		7%	
308	Improved Animal Products (Before Harvest)	9%		6%	
311	Animal Diseases	4%		34%	
312	External Parasites and Pests of Animals	6%		0%	
313	Internal Parasites in Animals	3%		3%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	1%		0%	
315	Animal Welfare/Well-Being and Protection	16%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	16.2	0.0	40.1	0.0
Actual Paid	17.2	0.0	49.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
368396	0	1041411	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
368396	0	1041411	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 USDA Farm Service to Conduct Farm Bill Training
- Multistate partnership consortium for dairy producers
- 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
- Increase Sheep Production Knowledge
- Coordinate Value-Based Marketing System for Cow-calf Operations
- Increase Beef Production Knowledge
- Conduct Ranch Visits

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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	12873	1096207	5843	1066143

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

Year: 2017
 Actual: 1

Patents listed

- 1. Orf virus based platform for vaccine delivery in cattle and swine

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	19	59	78

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	27

Output #2

Output Measure

- Publish and Disseminate Results of Nutritional Studies in Sheep Diets
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Learning Activities for Sheep Producers or Consumers

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

2017 9

Output #4

Output Measure

- Demonstrate Value-Based Marketing to Cow-calf Producers

Year	Actual
2017	1

Output #5

Output Measure

- Create Learning Opportunities in the Beef Industry

Year	Actual
2017	1

Output #6

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	26

Output #7

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	165

Output #8

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	2

Output #9

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	95

Output #10

Output Measure

- Educate Producers with Information Impacting the Dairy Industry

Year	Actual
2017	32

Output #11

Output Measure

- Develop Approaches for Detection, Prevention and Control of Viral Diseases of Swine
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Animals and Their Systems Hatch Research Projects
2	Enable Further Research to Explore Diet Formulation Strategies for Feeding Ruminant Livestock
3	Number of Individuals Participating in Sheep Production Learning Activities
4	Number of Cow-calf Operations Participating in the Calf Value Discovery Program
5	Number of Individuals Participating in Beef Production Learning Activities
6	Sustain and Enhance Growth in Dairy Production
7	Reduce the Impact of Porcine Reproductive and Respiratory Syndrome Virus on Swine Producers

Outcome #1

1. Outcome Measures

Number of Animals and Their Systems Hatch Research Projects

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	28

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 31 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 and Food Science, and our Department of Veterinary and Biomedical Sciences. Projects include but are not limited to research studies to improve health and performance in dairy cattle, epidermis repair of food animals, pre-harvest management of beef cattle, co-product feeds for sheep, 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:

Early detection of subclinical diseases in dairy cows, enhance the innate immune system and speed repair of livestock wounds, growth-promoting implants in nursing calves, 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
312	External Parasites and Pests of Animals
313	Internal Parasites in Animals
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
315	Animal Welfare/Well-Being and Protection

Outcome #2

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #3

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
2017	9

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.

What has been done

With its partners, SDSU Extension continues to support the sheep industry with producer education programs. In particular, SDSU Extension's signature program SD Post Weaning Lamb Performance program 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. Extension and research personnel in the four-state region of SD, ND, WY and MT contribute to the success of the SD Post Weaning Lamb Performance program

Results

During 2017, SDSU Extension personnel were involved in many events, reaching more than 951 participants. Participants gained knowledge on many topics including grazing plans, sheep shearing, wool traits, technology in the sheep industry, the economic value of wool, the Sheep Safety and Quality Assurance program, and sheep management practices. Since 2012, a learning community called Growing South Dakota Sheep Producers was formed to support SD sheep producers. This group is comprised of more than 83 sheep producers, loan officers, sheep shearers, lamb marketing representatives and any industry related personnel who all have an interest in the sheep industry and collaborating with SDSU Extension. A mentorship program provides opportunities for beginning producers to connect with established producers. Due to the additional emphasis placed on sheep production in SD, attendance to the South Dakota Sheep Growers Association's Convention has grown from 54 attendees in 2012 to 160 in 2017.

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 #4

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	17

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 9 cow-calf operations participated with 189 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 #5

1. Outcome Measures

Number of Individuals Participating in Beef Production Learning Activities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	73

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the most recent USDA Census of Agriculture, the average age of U.S. producers is 58 and continues to increase. Continuity in land ownership and management requires the entry of new operators. Beginning ranchers are available but have a variety of challenges. Many beginning operators have limited experience and possibly limited knowledge about beef cattle enterprise operation, land management, and resource and business planning. They may need help in transitioning into ranching and require access to a variety of resources and experiences to be successful. BeefSD equips beginning ranchers to continue to feed the world as the population expands.

What has been done

Numerous educational, research-based activities were completed in 2017 including the completion of 3 Case Studies of successful ranching operations, conducted 5 webinars, and engaged participants through a social media site. The participants were involved in the first Beef Travel Study Trip to Nebraska, Kansas, and Colorado to expand knowledge of the entire U.S. beef cattle industry. Participants entered animals into Calf Value Discovery program. Half of the participants attended Beef 20/20 and the other half attended SDSU Extension Grazing School.

Results

The following impacts were reported by the participants in the mid-project evaluation survey:

- ?71% of the participants have increased their knowledge of financial tools for beef production
- ?60% have used financial statements to make management decisions since starting the program.
- ?66% have increased their commodity marketing knowledge over half since starting the program.
- ?88% have used their marketing plans or plan to since starting the program.
- ?78% have used their goals to make management decisions since starting the program

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Sustain and Enhance Growth in Dairy Production

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	32

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Presently, there are 235 dairy farms with an estimated 116,000 dairy cows in South Dakota (USDA, January 2017) versus 2011 when there was an estimated 91,000 cows (USDA, July 2011). As identified by stakeholders, the present issues and needs of the dairy industry in this region are focused on three areas: 1) Market Assessment and Accessibility, 2) Social License to Grow ? public perception, and 3) Dairy Development ? availability of labor, succession planning and natural resources.

What has been done

With its many partners and collaborators, SDSU Extension was involved in 32 events to present research based information to the dairy industry and the general public. Farm tours, workshops, expos, demonstrations, and festivals are all part of the outreach efforts to share information and knowledge about the dairy industry. The events were carried out to provide unbiased information, increase profitability, optimize resource management, and enhance learning communities and build partnerships.

Results

Approximately 1,899 participants at 32 Dairy Fest events increased their knowledge of the dairy industry. The educational events included Farm to Fork, a Dairy Fest Carnival, SDSU Dairy Plant tours and Golden Dakota Dairy Plant tours. During the farm tours it was especially valuable for the participants to network with other producers and dairy industry personnel. Public awareness about opportunities for personal employment or business ventures was provided through the Dairy Fest events. The educational efforts of SDSU Extension enhance the sustainability of the dairy industry in South Dakota and strengthen the rural economy through improved profitability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #7

1. Outcome Measures

Reduce the Impact of Porcine Reproductive and Respiratory Syndrome Virus on Swine Producers

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Calf Value Discover program evaluation results:

- Average feeding costs were \$276.31 per animal
- Average feedlot total costs were \$415.09 per animal
- Total cost of gain of \$0.57/pound
- Carcass value averaged \$1,880.03 with the range from \$1,633 to 2,358 (grid marketing basis)
- When including the value of the feeder calf, there was a \$620.65 per animal range in return from a profit of \$197 to a profit of \$903

Growing South Dakota Sheep evaluation results:

The following information taken from the 2017 NASS Report shows an increase in sheep producers and production in SD, which can be attributed to efforts made by SDSU Extension and its partners to promote participation in the sheep industry.

- Breeding sheep inventory totaled 200,000 head, up 7,000 from 2016. Ewes one year and older totaled 161,000 head, up 10,000 from 2016. Total replacement lambs totaled 33,000 head, up 1,000 from last year.

Growing the South Dakota Dairy Industry evaluation results:

An impact survey was conducted following the 2017 Dairy Fest Tours with summary results as follows:

1. How would you rate the quality of the tour based on the information that you have implemented or plan to implement on your farm (1=lowest, 10 = highest)
 - 40% of respondents answered with a score of 8
 - 60% of respondents answered with a score of 9
2. What is one change you made on your operation as a result of attending the tour?
 - Calf Feeding, learning the knowledge of larger dairies, looking more at the big picture daily, it was a really long day-Great Tours but a long day.
3. What can be improved to make this tour better?
 - Tour of one nondairy business - winery, cheese plant, etc.
 - Nothing was a great tour
 - Having the tour of Riverview followed by a presentation on organic grazing was odd, I wouldn't recommend that again.
 - A tour with destinations that are closer to the I-29 Region or split it into two days of tours
 - The tours were great! Learned lots at both tour stops.
4. Please select all that apply: Dairy producer, Heifer grower, Dairy beef producer, Dairy Industry, Student, Academia, Other
 - Dairy producer - 16.67%, Heifer grower - 0%, Dairy beef producer - 16.67%, Dairy Industry - 66.67%, student 0%, Academia - 0%
5. What future programs and information would you like to see I-29 Moo University bring to you?
 - Manure management, Alfalfa management
 - I'm not sure

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
102	Soil, Plant, Water, Nutrient Relationships	8%		0%	
111	Conservation and Efficient Use of Water	22%		0%	
401	Structures, Facilities, and General Purpose Farm Supplies	44%		10%	
402	Engineering Systems and Equipment	0%		10%	
403	Waste Disposal, Recycling, and Reuse	18%		66%	
404	Instrumentation and Control Systems	0%		14%	
405	Drainage and Irrigation Systems and Facilities	8%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	9.7	0.0	3.3	0.0
Actual Paid	7.5	0.0	7.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
161173	0	154283	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
161173	0	154283	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

- Conducted Research to Produce Activated Carbon
- Conducted Research to Create New Sources of Biomass
- Conducted Research on Drainage and Water Management Design

2. Brief description of the target audience

- Researchers
- Supercapacitor and Energy Industries
- Biofuel Industry
- Scientists
- Farmers
- Landowners

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15380	1074367	3498	5906

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	51	51

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
2017	4

Output #2

Output Measure

- Number of Subsurface Drainage Design and Water Management Workshops
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	5

Output #4

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	10

Output #5

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	0

Output #6

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	15

Output #7

Output Measure

- Conduct Research to Characterize Microbial Samples
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Conduct Research to Create New Sources of Biomass
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Conduct Research on Carbon Materials and Biofuel Technologies
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Agricultural, Natural Resource, and Biological Engineering Hatch Research Projects
2	Number of Subsurface Drainage Design and Water Management Workshop 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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research in bioenergy technology is needed to enhance energy independence for 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 bio-char based activated carbon, 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:

Bio-char derived from activated carbon for water purification as well as applications into biomedical areas such as blood purification, the transformation of biochar into graphene to be used in supercapacitor energy storage devices, the 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 Subsurface Drainage Design and Water Management Workshop Participants

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Enhance Understanding of Bio-renewable Graphene Production

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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%		34%	
502	New and Improved Food Products	0%		16%	
503	Quality Maintenance in Storing and Marketing Food Products	20%		2%	
504	Home and Commercial Food Service	45%		0%	
511	New and Improved Non-Food Products and Processes	0%		48%	
703	Nutrition Education and Behavior	25%		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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.2	0.0	11.7	0.0
Actual Paid	1.1	0.0	18.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
23025	0	385708	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
23025	0	385708	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

- Evaluate Native Plants for Medicinal Uses
- 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
- 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

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1274	249362	1402	1946

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

Year: 2017
 Actual: 1

Patents listed

- 1. Production of Food Grade Distillers Dried Grains

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	3	0

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
2017	10

Output #2

Output Measure

- Developed a Strong Research Program to Enhance the US Dairy and Food Industry
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Extract and Analyze Oilseeds to Determine Biofuel Production Suitability

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

2017 1

Output #4

Output Measure

- Number of BBQ Bootcamp Workshops

Year	Actual
2017	4

Output #5

Output Measure

- Number of Publications Posted on iGrow Website
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	5

Output #7

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	6

Output #8

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	4

Output #9

Output Measure

- Conduct Research to Utilize Milk Components in Dairy Products
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Food and Non-Food Products: Development, Processing, Quality, and Delivery Hatch Research Projects
2	Increase Knowledge of Structure-Function Relationships of Milk Proteins
3	Increase Knowledge for Obtaining Maximum Oil Yields
4	Number of BBQ Bootcamp Participants

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	8

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 accomplished using less land, less water and less energy than is used today. Science driven technologies must be developed for this to be achieved in a sustainable manner.

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 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 and Food Science, and our Department of Biology and Microbiology. Projects include but are not limited to emerging technologies in dairy manufacturing, plant compounds used to promote human and animal life, conversion of lignocellulosic biomass into advanced liquid biofuels, 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:

Controlling and optimizing dairy product properties, identifying medicinal uses of plants traditionally used by Native Americans, upgrading bio-oils into hydrocarbon biofuels, 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
504	Home and Commercial Food Service
511	New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

Increase Knowledge of Structure-Function Relationships of Milk Proteins

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Increase 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
2017	1

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

A solvent-assisted extrusion process was carried out by simultaneous application of a laboratory scale single-screw extruder and plant-derived biodegradable solvent. The goal is to evaluate and compare the technical and economic feasibility of solvent extraction and cold press for efficiently extracting oils from various oilseeds for further conversion into bio jet fuels.

Results

The preliminary experimental results with camelina and carinata have revealed that increasing temperature and reducing the screw speed during extrusion usually increases the oil extraction yield by 15-20%. With the camelina and carinata seeds, it was discovered that soaking the seeds in green solvent prior to extrusion helped in reducing the residual oil content compared to those with no solvent. The conclusion is that the proposed method is green, clean and efficient.

4. Associated Knowledge Areas

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

Outcome #4

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
2017	1000

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. Consumers are also unsure of the proper way to handle and prepare meat to ensure both safety and quality.

What has been done

SDSU Extension conducted two full workshops in Sioux Falls and Brookings, one Youth Bootcamp at the Summer Spotlight in Huron, and one modified program in Sioux Falls. The full workshops, which had 80 participants, provided intensive, hands-on opportunities for consumers to enhance their understanding of meat cookery, barbequing, smoking, food safety, meat selection, and nutrition. The youth program was modified for a younger audience and presented to 20 exhibitors at the Summer Spotlight Show in Huron. The modified program in Sioux Falls, which had 900 participants, informed consumers of the nutrition and convenience of beef tri-tip.

Results

Participant evaluations indicate the workshops were very successful in educating consumers. According to participant evaluations the program greatly enhanced their understanding of cookery, selection, and nutritional content of common beef cuts as shown by the 2.5 unit increase in knowledge. Additionally, the participants viewed the program as extremely beneficial as they rated the program at 9.6 out of a possible 10 points.

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

BBQ Bootcamp

80 participants 17 returned surveys

Presentation

1 = not valuable; 10 = highly valuable

8.9 - Meat Selection and Retail Cuts

8.2 - Grilling, Smoking, Barbequing, Retail Selection

8.4 - Food Safety & Degrees of Doneness

8.4 - Spices, Rubs, & Marinades

Question

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

9.0 - Did the speaker effectively explain the information?

5.6 - Knowledge level before program?

8.1 - Knowledge level after program?

9.6 - 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	37%		10%	
602	Business Management, Finance, and Taxation	33%		15%	
603	Market Economics	10%		23%	
604	Marketing and Distribution Practices	10%		19%	
605	Natural Resource and Environmental Economics	5%		11%	
607	Consumer Economics	5%		10%	
608	Community Resource Planning and Development	0%		12%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	7.6	0.0	15.0	0.0
Actual Paid	6.4	0.0	9.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
138149	0	192854	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
138149	0	192854	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 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8489	859159	1147	1019

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

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	3	5	8

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	5

Output #2

Output Measure

- Number of Ag CEO Workshops
- Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	3

Output #4

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	31

Output #5

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	1

Output #6

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	21

Output #7

Output Measure

- Conduct Research to Enhance Rural Sustainability and Quality of Life
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Conduct Farm Bill Training
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Economics, Markets, and Policy Hatch Research Projects
2	Number of New Participants in the Ag CEO Program
3	Enhance Sustainability and Quality of Life in Rural South Dakota

Outcome #1

1. Outcome Measures

Number of Economics, Markets, and Policy Hatch Research Projects

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	9

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 the economics of a bio-based industry, price behaviors of agricultural commodity derivatives, enhancing rural sustainability and quality of life, market studies for South Dakota produced beef, and agricultural land market trends.

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:

The development of modeling and systems approaches to support sustainable biomass production, scientific and practical needs of flexible models for agricultural commodities, gender-based information for entrepreneurs in rural South Dakota, development of a marketing strategy for finished cattle, agricultural and international trade policy issues in the Northern Great Plains, commodity characteristic values of Hard Red Spring Wheat, and land markets and land management 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
602	Business Management, Finance, and Taxation
603	Market Economics
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics

Outcome #2

1. Outcome Measures

Number of New Participants in the Ag CEO Program

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Enhance Sustainability and Quality of Life in Rural South Dakota

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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	0%		38%	
703	Nutrition Education and Behavior	34%		35%	
704	Nutrition and Hunger in the Population	21%		1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		5%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		9%	
724	Healthy Lifestyle	45%		7%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	11.9	0.0	11.7	0.0
Actual Paid	15.0	0.0	9.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
322347	0	192854	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
322347	0	192854	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 Community Garden Workshops
- Conduct Research on Bioactive Food Components
- Conduct Research for the Prevention and Treatment of Obesity
- Conduct Research to Understand Nutrient-gene Interactions
- Teach Food Safety Programs
- Conduct Home Food Preservation Workshops
- Conduct Local Food Entrepreneur Programs
- Develop Nutrition and Physical Activity Curriculum
- Train Teens as Teachers
- 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
- 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5172	289487	3005	4944

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

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	21	23

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
2017	5

Output #2

Output Measure

- Number of Food Processing and Food Marketing Events
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Gerontology Events Presented

Year	Actual
2017	5

Output #4

Output Measure

- Number of Healthy Living Events that Created Learning Opportunities

Year	Actual
2017	4

Output #5

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	42

Output #6

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	76

Output #7

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	7

Output #8

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	10

Output #9

Output Measure

- Number of Garden Development or Enhancement Workshops and Webinars Conducted
Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Increase Quality of Life for Refugees in South Dakota

Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Conduct Research on the Role of Vitamin D, Calcium and Bioactive Food Components

Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Human Nutrition, Food Safety, and Human Health and Well-Being Hatch Research Projects
2	Number of Food Processing and Food Marketing Participants
3	Increase Knowledge of Aging Issues to Participants
4	Number of Participants Involved in Healthy Living Learning Opportunities
5	Number of Community or School Gardens Receiving Assistance with Development or Enhancement
6	Number of New Roots for New Americans Program Participants
7	Prevent Obesity and Obesity Related Disorders

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4

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 four 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 functionality traits of wheat dough, dietary bioactive food 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:

Development of a vacuum dough expansion system for predicting bread loaf volume, implications that an increased intake of vitamin D and calcium may be beneficial for the prevention of obesity, understanding and preventing the underlying mechanisms of chronic diseases, innovative approaches to increase healthy nutrition and physical activity in 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
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of Food Processing and Food Marketing Participants

Not Reporting on this Outcome Measure

Outcome #3

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
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Dakota is a large state with many South Dakotans living in rural areas. What's more, a large number of these individuals are age 65 or older. Many adults report specific goals (e.g., remaining in their home), yet few have taken steps to achieve their goals (e.g., home modifications). To achieve these goals, South Dakotans must be aware of resources, services, opportunities for community engagement, and other relevant information. Currently a large scale

coordinated effort to connect South Dakotans with resources, services, opportunities for community engagement, and other relevant information is not available. Current efforts are disjointed, with individual communities attempting to raise awareness. While commendable, lack of coordination results in the omission of vital information (dementia, consumer protection, long-term care, nutrition, etc.). In addition, there is little evidence that these activities are leading to changes in behavior.

What has been done

The Aging Gracefully Expo (AGE) event was held throughout South Dakota utilizing technology to broadcast presentations from more urban areas to rural communities. Rural communities participating in AGE activities chose how they wanted to be involved. Some communities had vendors and presentations, while others only had presentations. Webcast technology was utilized as a solution to increase the availability of the content of the presentations. As an example, the webcast presentations were able to be viewed on a smartphone or tablet, as well as a computer.

Results

The Aging Gracefully Expo (AGE) took place in five communities in 2017, four of which were rural communities receiving the webcast. Estimates suggest that 500 people were impacted by AGE activities in these five communities. In addition, the webcast was accessed by 35 additional I.P. addresses.

4. Associated Knowledge Areas

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

Outcome #4

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
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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

Through partnerships, SDSU Extension is involved in many programs that help create or maintain healthy living environments. Wellness coalitions have been established by several rural communities to address community health and wellness. South Dakotans with chronic diseases learn to live with their conditions through self-management workshops conducted across the state. A new statewide walking program was launched to positively influence the health and wellbeing of participating residents living in rural South Dakota communities with populations of 3,500 or less. Statewide, Prescription passes have been administrated to healthcare providers to provide to their patients.

Results

By working with many organizations, including healthcare providers, health professionals, advisory groups, the South Dakota Department of Health, and the South Dakota Game, Fish and Parks, SDSU Extension has impacted thousands of individuals. Wellness coalitions have implemented interventions that promote access to fruits and vegetables, increased healthy eating behaviors, and to provide access to physical activity opportunities. Over 20 healthcare clinics and locations across the state have been involved in a program that has passed out a total of 4,850 Prescription Passes to be used at South Dakota State Parks for increasing physical activity at outdoor gyms, and through the rural walking program. Through the facilitation of a new rural walking program, social connectivity, physical activity, and the number of walk advocates increased. All these actions are empowering community members to live healthy lifestyles.

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 #5

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of New Roots for New Americans Program Participants

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Prevent Obesity and Obesity Related Disorders

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Gerontology - Aging Gracefully Expo (AGE)

Attendees were asked if they had any intentions as a result of attending the AGE event. "Increase physical activity, volunteer, explore health care options, and explore nutrition options" were the most frequently reported intentions. Using technology to connect with older adults is often met with concerns about the receptiveness of this audience to technology. 2017 Evaluation results indicated older people were satisfied with their experience viewing the AGE webcast presentations, suggesting that technology is a viable

option for reaching older people living in South Dakota.

Key Items of Evaluation

{No Data Entered}

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	4%		0%	
704	Nutrition and Hunger in the Population	19%		0%	
801	Individual and Family Resource Management	13%		100%	
802	Human Development and Family Well-Being	11%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	14%		0%	
806	Youth Development	39%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	42.1	0.0	1.7	0.0
Actual Paid	45.1	0.0	3.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
967040	0	77142	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
967040	0	77142	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

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	12825	518565	37954	57614

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

Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	0	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	2

Output #2

Output Measure

- Number of Teens Trained in the Teens as Teachers Program
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of High School Students Selected as 4-H Hometown Hero Representatives
 Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of Communities Hosting the Ripple Effect Mapping

Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of Events Conducted on Native American Reservations

Year	Actual
2017	31

Output #6

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2017	33

Output #7

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2017	89

Output #8

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2017	5

Output #9

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2017	5

Output #10

Output Measure

- Conduct Activities that Build Community Capacity

Year	Actual
2017	1

Output #11

Output Measure

- Create Financial Literacy Learning Opportunities
Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Conduct Character Education Programs and Activities
Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Create Learning Opportunities for Youth

Year	Actual
2017	1

Output #14

Output Measure

- Create Resource Management Learning Opportunities
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Families, Youth and Communities Hatch Research Projects
2	Number of Students Taught by Teens as Teachers
3	Number of Elementary Students Impacted by 4-H Hometown Hero Representatives
4	Ripple Effect Mapping Participants
5	Number of Participants Involved in Native American Reservation Events
6	Enhance Rural Community Sustainability in South Dakota
7	Increase Family and Personal Financial Literacy to Participants
8	Build Good Character in South Dakota's Youth
9	Develop Life Skills for Youth
10	Increase Individual and Family Quality of Life

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
2017	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 financially.

Results

Through research, we continue to build a scientific knowledge base to improve and understand the sociological factors associated with personal finance. A cross-cultural survey on college student financial management behavior was created and administered at South Dakota State University and in Korea. Compared to Korean college students, the SDSU students had more debt and financial stress, but were more optimistic about their economic future. A manuscript for the survey findings is being prepared for peer-reviewed publication.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Number of Students Taught by Teens as Teachers

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Ripple Effect Mapping Participants

Not Reporting on this Outcome Measure

Outcome #5

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
2017	1757

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are many agriculture related issues that need to be addressed on South Dakota's reservations. Access to nutritious food is limited. The knowledge of traditional foods is getting lost. Many tribal land owners own fractionated allotments of land and lack the knowledge of how to lease the land or obtain funding. The rangelands are sometimes overgrazed or the plants are exposed to pesticide overspray. There is a huge interest for agriculture programs on the reservations.

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 horticulture and livestock programs, gardening workshops, food preparation and preservation classes, workshops that focus on wild and native foods and herbs, and participated in farmers markets.

Results

Native American Reservation communities in South Dakota benefit greatly from SDSU Extension's efforts. Members of all ages gained knowledge in many areas. Wellness coalitions have helped in the implementation of interventions that promote healthy behaviors. New community gardens are providing access to fresh fruits and vegetables that were otherwise not available. On Rosebud Reservation, youth learned about wild edible plants and medicinal plants, as well as livestock usage. Another program on Rosebud Reservation offers training in financial literacy, workforce development and capacity building for entrepreneurs and organizations. All of these programs contribute to self-sufficiency, sustainability, and empowering tribal members.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #6

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
2017	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As organizations and groups in South Dakota prepare for their future, the need for planning is apparent. But rural communities often lack the resources to address important issues. By helping to build community capacity and equipping them with the tools they need, rural communities can increase their chance of sustainability.

What has been done

During this reporting period, the SDSU Extension Community Vitality team focused their efforts on strengthening businesses for communities across the state. A "Small Business is Everybody's Business" conference focused on how communities could support young entrepreneurs and was offered via DDN to bring national speakers to local communities. A series of 4 to 6 classes was held called "Small Business Basics" to assist current and potential business owners with developing a business plan. A 3-hour workshop, "Secrets of Service: Improving Customer Satisfaction" was held focusing on teamwork, communication, and personality styles.

Results

Educational opportunities were held statewide to help communities create an environment that's favorable to entrepreneurship growth. Through the facilitation of three different programs, a total of 167 individuals participated in 18 locations.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Increase Family and Personal Financial Literacy to Participants

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Build Good Character in South Dakota's Youth

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Develop Life Skills for Youth

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Less than 1% of the population is now directly involved in farming. In addition, it is extremely difficult for the Millennial Generation to get started in farming due to the lack of capital resources. And there is a shortage of qualified workers in certain areas of the agriculture industry. We must reach rural and urban youth to educate them about the possibilities of careers in agriculture.

What has been done

With many partners, SDSU Extension reached South Dakota youth through many programs and events. Dairy Fest is a three-day celebration where dairy farmers, processors, and industry leaders bring the community together for the public to learn about dairy production. Dairy Cattle Judging schools were conducted throughout South Dakota that teach youth important life skills. An educational Fork to Farm event was held to share information and knowledge about the dairy industry. Youth and adult volunteers were exposed to dairy production and dairy manufacturing areas in the STEM curriculum.

Results

As our youth continue to learn about agriculture and life skills, many will be the next generation that will keep the agriculture industry in South Dakota sustainable. Our youth gained valuable life skills in animal evaluation, quality standards, processed dairy products, profitable production

practices, confidence and resilience building, decision making, and public speaking. It is extremely important that we reach out to the young to prevent a shortage of people working in the agriculture industry. More than 300 youth participated in 14 educational events.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #10

1. Outcome Measures

Increase Individual and Family Quality of Life

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The prosperity of farm and ranch families is critical to the sustainability of rural South Dakota. Whether it is young producers, women in agriculture, or the older generation of farmers and ranchers - they all need business and management resources to help keep their operations thriving.

What has been done

SDSU hosted a Native American Beginning Farmer and Rancher program to empower the average tribal member to become a local food producer. Workshops for Annie's Project were conducted that addressed estate planning as well as insurance, wills, finances and business plans. Annie's Project is a national program designed to strengthen women's role in farming and ranching.

Results

Due to attending the Beginning Farmer and Rancher program, participants are more knowledgeable of how to become a local food producer, more aware of food access issues, have an increased awareness of food utilization at home and knowledge and awareness of USDA and SDSU programs that exist to help them. The 77 women that attended the Annie's Project workshops increased their knowledge and expertise to become better business partners. The

program also provided an environment for women to network with other women in agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Annie's Project

Women are making themselves more knowledgeable partners in farm and ranch businesses, plus a better owner/operator.

The most important things women learned was information about estate planning, marketing and basic financial documents.

Increased knowledge and expertise of women to become better business partners.

Increased understanding of marketing, estate planning, finances and production systems

50% of the participants have started or continued working on will/estate transition plan to prepare for the future.

74% of the participants have started or continued working on improving their marketing strategies.

74% of the participants have started or continued working on understanding and calculating financials for the operation.

2017 Qualitative Impacts:

"Hello! I am a 2009 participant in Annie's Project and have very fond memories of the classes and women who participated. I wanted to write to encourage you to continue to offer the program, as it had a very positive impact in how I viewed my role as farmer's spouse and how I could contribute to the operation. The friendships I made were very supportive, and although I am no longer in touch with those amazing women, I am forever blessed by their friendship."

"You see, also at that time my husband was undergoing cancer treatment. He lost his battle Jan. 10th of 2010, and with him I lost my connection to the farm life. Women can never be prepared enough to soldier on through such losses, especially when family income is drawn for farming life. While it was too late for me personally, I continue to see and advocate Annie's Project as a very important source of information and support to women in Ag."

Hot Springs Learning Community continues to meet monthly during the winter months to discuss current topics and network. Women share very personal stories and challenges because of the strong network the group has developed and they find great value in learning from their peers as well as professionals.

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.