V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

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

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	0%		22%	
502	New and Improved Food Products	0%		32%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		4%	
504	Home and Commercial Food Service	80%		0%	
511	New and Improved Non-Food Products and Processes	0%		41%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	0%		1%	
703	Nutrition Education and Behavior	10%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	24.6	0.0
Actual Paid	2.6	0.0	28.8	0.0
Actual Volunteer	0.3	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
102496	0	501413	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
102496	0	519463	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

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

3. How was eXtension used?

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2014

Actual: 1

Patents listed

Method and System for Improving Yogurt Texture During Yogurt Manufacture

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	12	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2014	10

Output #2

Output Measure

- Number of BBQ Bootcamp Workshops

Year	Actual
2014	6

Output #3

Output Measure

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

Year	Actual
2014	0

Output #4

Output Measure

- Extracted and Analyzed Oilseeds to Determine Biofuel Production Suitability

Year	Actual
2014	0

Output #5

Output Measure

- Conduct Research to Utilize Milk Components in Dairy Products

Year	Actual
2014	0

Output #6

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	139

Output #7

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	212

Output #8

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	1

Output #9

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	25

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15

3c. Qualitative Outcome or Impact Statement

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

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

Results
Through research, we continue to build a scientific knowledge base to improve and understand food and non-food products.
Examples include:
The manufacture of modified milk protein concentrates to be used as ingredients in food products, improved health and nutrition benefits from dairy products, and the development of an oilseed based biofuel industry - biodiesel, bio-jet fuel, oil additives, and specialty lubricants that can help reduce our dependence on petroleum-based products. The biofuel industry also provides opportunities for agricultural diversification and rural sustainability in South Dakota. In addition,

graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of BBQ Bootcamp Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	350

3c. Qualitative Outcome or Impact Statement

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

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

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

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Increase Knowledge of Structure-Function Relationships of Milk Proteins

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
The research work was mainly focused to benefit the dairy industry in the South Dakota State, Midwest Region (research conducted through Midwest Dairy Foods Research Center) and the US as a whole. It is also anticipated the research outcomes generated from this project will be useful in improving the functionality of dairy products, manufacturing dairy and food products with clean

label, will also help to design food production with better nutritional properties, which help to combat some pressing health issues currently faced by the USA and rest of the world e.g. obesity, healthy aging, weight management.

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

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Increased Knowledge for Obtaining Maximum Oil Yields

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

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

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

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Increase the Potential to Expand Dairy Production in the United States

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done

Research was conducted on the manufacture of modified milk protein concentrates and their utilization as ingredients.
This includes evaluating the effectiveness of the modified functionality of the concentrates when used in process cheese products and the evaluation of new membrane materials during the production of whey protein concentrates. Research results were disseminated at seminars, presentations, and meetings.

Results

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

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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

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

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

BBQ Bootcamp
350 participants 55 respondents
Presentation
1 = not valuable; 10 = highly valuable
7.8 - Grilling, Smoking, Barbequing, Retail Selection
7.9 - Food Safety & Degrees of Doneness
8.5 - Spices, Rubs, & Marinades

Question
1 = absolutely not, 10 = absolutely; 1 = no knowledge, 10 = expert knowledge
8.6 - Did the speaker effectively explain the information?
5.6 - Knowledge level before program?
7.9 - Knowledge level after program?
9.3 - Was the program beneficial?
8.8 - Was the program beneficial in helping understand food safety, handling, and proper cooking temperatures for meat?

Key Items of Evaluation