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

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
<th>%1862 Extension</th>
<th>%1890 Extension</th>
<th>%1862 Research</th>
<th>%1890 Research</th>
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</thead>
<tbody>
<tr>
<td>501</td>
<td>New and Improved Food Processing Technologies</td>
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<tr>
<td>502</td>
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<td>504</td>
<td>Home and Commercial Food Service</td>
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<tr>
<td>511</td>
<td>New and Improved Non-Food Products and Processes</td>
<td>0%</td>
<td></td>
<td>69%</td>
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<tr>
<td>703</td>
<td>Nutrition Education and Behavior</td>
<td>10%</td>
<td></td>
<td>0%</td>
<td></td>
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<tr>
<td>712</td>
<td>Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins</td>
<td>10%</td>
<td></td>
<td>0%</td>
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</table>

Total 100% 100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

<table>
<thead>
<tr>
<th>Year: 2015</th>
<th>Extension</th>
<th>Research</th>
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<tr>
<td></td>
<td>1862</td>
<td>1890</td>
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<tr>
<td>Plan</td>
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<tr>
<td>Actual Paid</td>
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<tr>
<td>Actual Volunteer</td>
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</table>

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

1. Brief description of the Activity

• Evaluate Native Plants for Medicinal Uses
• Conduct Research on Co-products of Corn and Soybeans
• Research and Improve Biofuel Production Processes
• Conduct Barbeque 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
• Health Researchers
• 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
2015 South Dakota State University Combined Research and Extension Annual Report of Accomplishments and Results - Food and Non-Food Products: Development, Processing, Quality, and Delivery

<table>
<thead>
<tr>
<th></th>
<th>Direct Contacts Adults</th>
<th>Indirect Contacts Adults</th>
<th>Direct Contacts Youth</th>
<th>Indirect Contacts Youth</th>
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</thead>
<tbody>
<tr>
<td>Actual</td>
<td>1299</td>
<td>197533</td>
<td>1225</td>
<td>1932</td>
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</table>

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

**Patent Applications Submitted**

- **Year:** 2015
- **Actual:** 7

**Patents listed**

1. Method and System for Improving Yogurt Texture during Yogurt Manufacture
2. Production of Food Grade Distillers Dried Grains
3. Process of Manufacturing Non-strained Formulated High-protein Acid Gels Without Graininess Defect and Improved Mouth-feel
4. Application of a Food Grade Enzyme as Antimicrobial and Antispore Agent in Foods and Cleaning and Sanitation
5. Process for Manufacture of Mineral Stabilized Milk Permeate Powders
6. A Process for the Preparation of Heat Stable Whey Proteins
7. Method and System for Improving Yogurt Texture During Yogurt Manufacture

3. **Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<table>
<thead>
<tr>
<th></th>
<th>Extension</th>
<th>Research</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Actual</td>
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</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td>2015</td>
<td>7</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td>2015</td>
<td>1</td>
</tr>
</tbody>
</table>

Output #4

Output Measure

- Number of BBQ Bootcamp Workshops

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td>2015</td>
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</tr>
</tbody>
</table>

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
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

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

Output #8

Output Measure

- Number of Radio Programs Posted on iGrow Website
  Not reporting on this Output for this Annual Report
Output #9

Output Measure

- Conduct Research to Utilize Milk Components in Dairy Products

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1</td>
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</tbody>
</table>
## V(G). State Defined Outcomes

### V. State Defined Outcomes Table of Content

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>7</td>
</tr>
</tbody>
</table>

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 seven 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 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
   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
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0</td>
</tr>
</tbody>
</table>

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**
SDSU has investigated oil extraction from sunflower, camelina, canola, flax, safflower, and carinata using two different approaches, cold press and solvent extraction. The oils produced were characterized for heating value, density, viscosity, pH value, chemical composition (fatty
acid profile), elemental composition, etc. 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
A novel catalytic cracking process for converting inedible oils (non-food oilseeds, animal fats, waste oils, etc.) to hydrocarbon based advanced biofuels was carried out. Sunflower, camellia, and canola oils have been successfully upgraded to hydrocarbon fuels. The results have been presented to national and international conferences.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>511</td>
<td>New and Improved Non-Food Products and Processes</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
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</table>

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 five 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

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>504</td>
<td>Home and Commercial Food Service</td>
</tr>
<tr>
<td>703</td>
<td>Nutrition Education and Behavior</td>
</tr>
<tr>
<td>712</td>
<td>Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and</td>
</tr>
<tr>
<td></td>
<td>Naturally Occurring Toxins</td>
</tr>
</tbody>
</table>

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Economy
- Competing Programmatic Challenges

Brief Explanation
Climate variability in South Dakota can be extreme. Drought and blizzards are very common, which can cause programming and resources to be redirected.

With the dairy industry expanding in South Dakota, the Hispanic workforce continues to grow. There is also a small growth of Karen in parts of the state that could continue to expand.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

State Defined Outcome #4
Survey:
BBQ Bootcamp
200 participants 47 respondents
Presentation
1 = not valuable; 10 = highly valuable
8.4 - Meat Selection and Retail Cuts
8.8 - Grilling, Smoking, Barbequing, Retail Selection
8.3 - Food Safety & Degrees of Doneness
8.7 - Spices, Rubs, & Marinades

Question
1 = absolutely not, 10 = absolutely; 1 = no knowledge, 10 = expert knowledge
9.2 - Did the speaker effectively explain the information?
6.5 - Knowledge level before program
8.1 - Knowledge level after program
9.7 - Was the program beneficial?
9.1 - Was the program beneficial in helping understand food safety, handling, and proper cooking temperatures for meat?

Key Items of Evaluation

**BBQ Bootcamp**
Participant evaluations indicate the workshops were very successful in educating consumers, especially in the areas of food safety, handling, and proper cooking temperatures for meat.