V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Center for Nutrition and Pregnancy

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>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Reproductive Performance of Animals</td>
<td>0%</td>
<td>40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>Nutrient Utilization in Animals</td>
<td>0%</td>
<td>40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>305</td>
<td>Animal Physiological Processes</td>
<td>0%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>702</td>
<td>Requirements and Function of Nutrients and Other Food Components</td>
<td>0%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

<table>
<thead>
<tr>
<th>Year: 2009</th>
<th>Extension 1862</th>
<th>Extension 1890</th>
<th>Research 1862</th>
<th>Research 1890</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>0.0</td>
<td>0.0</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual</td>
<td>0.0</td>
<td>0.0</td>
<td>4.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Extension</th>
<th>Research 1890</th>
<th>Hatch</th>
<th>Evans-Allen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith-Lever 3b &amp; 3c</td>
<td>0</td>
<td>148800</td>
<td>0</td>
</tr>
<tr>
<td>1862 Matching</td>
<td>0</td>
<td>223200</td>
<td>0</td>
</tr>
<tr>
<td>1862 All Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Research projects
- Train students
- Publish research
- Secure funding
- Develop recommendations
- Identify emerging trends and issues
- Improve methodology
- Collaborate

2. Brief description of the target audience

- Students: graduate and under-graduate
- Livestock producers
- Human health professionals
- Scientific peer groups
- Policy and agency influences
- Media professionals

V(E). Planned Program (Outputs)

1. Standard output measures
### 2. Number of Patent Applications Submitted (Standard Research Output)

**Patent Applications Submitted**

- **Year:** 2009
- **Plan:** 0
- **Actual:** 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<table>
<thead>
<tr>
<th>2009</th>
<th>Extension</th>
<th>Research</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Actual</td>
<td>0</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

### V(F). State Defined Outputs

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}
V(G). State Defined Outcomes

<table>
<thead>
<tr>
<th>O. No.</th>
<th>OUTCOME NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Numbers of producers with enhanced knowledge from livestock programming events</td>
</tr>
<tr>
<td>2</td>
<td>Number of grant requests for multidisciplinary educational, extension and research collaborative activities</td>
</tr>
<tr>
<td>3</td>
<td>Number of visiting scientists to the NDSU Department of Animal and Range Sciences</td>
</tr>
<tr>
<td>4</td>
<td>Monitor cases of pregnancy-based metabolic diseases</td>
</tr>
<tr>
<td>5</td>
<td>Monitor North Dakota agricultural statistics to measure pregnancy rates of North Dakota livestock operations</td>
</tr>
<tr>
<td>6</td>
<td>The number of individuals including the beef and sheep industry and other scientists receiving information on the development of sustainable agricultural practices where maternal nutrition during pregnancy increases the nutrient and reproductive efficiency of their offspring.</td>
</tr>
</tbody>
</table>
Outcome #1

1. Outcome Measures

Numbers of producers with enhanced knowledge from livestock programming events

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of grant requests for multidisciplinary educational, extension and research collaborative activities

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of visiting scientists to the NDSU Department of Animal and Range Sciences

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Monitor cases of pregnancy-based metabolic diseases

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Monitor North Dakota agricultural statistics to measure pregnancy rates of North Dakota livestock operations

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

The number of individuals including the beef and sheep industry and other scientists receiving information on the development of sustainable agricultural practices where maternal nutrition during pregnancy increases the nutrient and reproductive efficiency of their offspring.

2. Associated Institution Types

• 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure
3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>(No Data Entered)</td>
<td>500</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Maternal nutrition during pregnancy has shown to influence the growth and development of the conceptus. In order to have healthy, productive livestock, proper fetal development is needed. Our long-term goal is to understand the specific nutrients and the specific time those nutrients are needed to be available to the dam to achieve healthy offspring. Specifically, we are studying how the maternal diet can influence the growth and development of nutrient transferring tissues which include the placenta, the mammary gland, and the gastrointestinal tract in ruminants.

**What has been done**
We have developed several models where the initiation and the duration of both nutrient restrictions (simulating drought conditions) and nutrient excess (a common management issue) can influence the development of the ovine placenta, mammary gland, and gastrointestinal tract. Moreover, we have evaluated the impacts of supranutritional selenium and nutritional intake on milk production and offspring performance. Models of twinning, age at first mating, and genotype have also been performed to determine how maternal factors can influence fetal growth.

**Results**
In ewe lambs, maternal nutritional intake does impact birth weight. Lambs born to restricted or overnourished ewes were lighter than to lambs born from adequately fed dams. Moreover, colostrum yield was decreased in both restricted and overnourished dams. However, milk production was similar between overnourished and adequately fed controls, but restricted dams did not catch up in milk production. Lambs born from dams that were restricted or overnourished were still lighter at weaning, even though they were raised independent of their dam. There was a higher mortality rate in lambs born from overnourished dams compared to those from restricted or control dams. Growth from weaning until market weight was similar. These research results will assist the sheep industry to improve their efficiency and profitability. Recent studies are also utilizing protein supplementation during the last trimester in pregnancy. It is known that protein levels in the diet may influence uterine and/or umbilical blood flow to the developing fetus. In a small pilot study, protein restriction increased maternal blood pressure and in vitro studies indicate a potential to have a decreased vasodilation. Future studies are underway to determine how this may influence offspring performance.

4. Associated Knowledge Areas

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V(H). Planned Program (External Factors)

**External factors which affected outcomes**

*Economy*

**Brief Explanation**

Low livestock prices and high input costs of productions limit the profitability of livestock ranchers. Production practices that increase production efficiency are needed so ranchers can stay in business.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned
• After Only (post program)

Evaluation Results

Key Items of Evaluation