V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program
Nutrition of Grazing Livestock

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>121</td>
<td>Management of Range Resources</td>
<td>50%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>Nutrient Utilization in Animals</td>
<td>50%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</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</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1862</td>
<td>1890</td>
</tr>
<tr>
<td>Plan</td>
<td>6.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual</td>
<td>7.0</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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith-Lever 3b &amp; 3c</td>
<td>Hatch</td>
</tr>
<tr>
<td>218400</td>
<td>0</td>
</tr>
<tr>
<td>1862 Matching</td>
<td>1890 Matching</td>
</tr>
<tr>
<td>327600</td>
<td>0</td>
</tr>
<tr>
<td>1862 All Other</td>
<td>1890 All Other</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

V(D). Planned Program (Activity)

1. Brief description of the Activity
   • Develop presentation materials
   • Develop resource material
   • Provide presentations and workshops
   • Translate scientific and technical materials into lay materials
   • Identify emerging issues
   • Evaluate effectiveness of activities

2. Brief description of the target audience
   • Livestock producers
   • 4-H youth
   • Feed and pharmaceutical industry personnel
   • Government agency personnel
   • Veterinarians

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>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>1</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

V. State Defined Outcomes Table of Content

<table>
<thead>
<tr>
<th>O. No.</th>
<th>OUTCOME NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of individuals receiving training and education</td>
</tr>
<tr>
<td>2</td>
<td>Number of individuals demonstrating increase in subject knowledge and skills</td>
</tr>
<tr>
<td>3</td>
<td>Number of producers implementing recommended actions or practices</td>
</tr>
<tr>
<td>4</td>
<td>Number of producers participating in government cost-share programs for range conservation</td>
</tr>
<tr>
<td>5</td>
<td>Estimated cost of production for North Dakota cattle ranches</td>
</tr>
<tr>
<td>6</td>
<td>Number of ranches implementing range management practices</td>
</tr>
<tr>
<td>7</td>
<td>North Dakota beef producers receiving current information on the use of ethanol byproducts as feed in their rations.</td>
</tr>
</tbody>
</table>
Outcome #1

1. Outcome Measures

Number of individuals receiving training and education

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of individuals demonstrating increase in subject knowledge and skills

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of producers implementing recommended actions or practices

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of producers participating in government cost-share programs for range conservation

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Estimated cost of production for North Dakota cattle ranches

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of ranches implementing range management practices

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

North Dakota beef producers receiving current information on the use of ethanol byproducts as feed in their rations.

2. Associated Institution Types
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>150</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Distiller's grains and distiller's solubles are byproducts of the fuel ethanol industry and economical feed resources for cattleman in areas where corn distilleries produce fuel ethanol. The limitation to inclusion of these products in the diets of cattle is the amount of sulfur in them. Sulfur occurs naturally in corn grain and is concentrated approximately 3-fold in the byproducts. Sulfur is also added at the plants as part of the process of converting starch to ethanol. In the rumen of cattle and sheep, dietary sulfur can be reduced chemically to sulfide by sulfate-reducing bacteria and released as hydrogen sulfide, a toxic gas. Sulfide can cause polioencephalomalacia, a central nervous system disorder, in cattle and sheep. This leads to both loss of production and increased death loss.

**What has been done**
NDSU research has characterized the effects of dietary incorporation of distiller's grains plus solubles on production outcomes in cattle, such as intake, gain, and gain efficiency. NDSU research has also assessed the production and timing of sulfide release in the rumen after distiller's grains plus solubles have been added to diets of both cattle and sheep. Finally, NDSU research has measured the impact of distiller's grains plus solubles on the quality attributes of meat from cattle fed distiller's grains.

**Results**
The incorporation of distiller's grains plus solubles into diet of cattle improves the ruminal environment from the standpoint of organic matter fermented in the rumen. This in turn generally improves intake, gain, and gain efficiency of the cattle. NDSU research has demonstrated that ruminal sulfur reduction is slow when cattle are fed primarily forage-based diets. As the diet includes more grain or distiller's grains, sulfide production rate increases. Incidence of polioencephalomalacia has been reported to peak about 4 weeks after introduction of dietary distiller's grains. Our research has not measured a change in ruminal gas cap sulfide concentrations to correlate to this change, although sulfide production rates in vivo are approaching maximum at this time. Although thiamine has been included in rations as a possible treatment for reducing the incidence of polioencephalomalacia, we have not found a response to feeding thiamine. Finally, quality attributes of meat from cattle fed distiller's grains has not been different from those that were not fed distiller's grains. Because distiller's grains are sold at a discount of approximately 5% to corn, cattle producers that feed corn will realize decreased feed costs and cost of gain by feeding more distiller's grains if biological upper limits can be increased. This research information is currently being transferred to beef producers in North Dakota.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>302</td>
<td>Nutrient Utilization in Animals</td>
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V(H). Planned Program (External Factors)

**External factors which affected outcomes**
- Economy

**Brief Explanation**
The increasing availability of byproducts from the ethanol industry has increased interest in using these
materials as livestock feed because of their lower cost.

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

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

Evaluation Results

Key Items of Evaluation