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

<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>201</td>
<td>Plant Genome, Genetics, and Genetic Mechanisms</td>
<td>0%</td>
<td>20%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>202</td>
<td>Plant Genetic Resources</td>
<td>0%</td>
<td>14%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>203</td>
<td>Plant Biological Efficiency and Abiotic Stresses Affecting Plants</td>
<td>0%</td>
<td>24%</td>
<td>0%</td>
<td>24%</td>
</tr>
<tr>
<td>204</td>
<td>Plant Product Quality and Utility (Preharvest)</td>
<td>20%</td>
<td>6%</td>
<td>20%</td>
<td>6%</td>
</tr>
<tr>
<td>205</td>
<td>Plant Management Systems</td>
<td>0%</td>
<td>11%</td>
<td>0%</td>
<td>11%</td>
</tr>
<tr>
<td>206</td>
<td>Basic Plant Biology</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>211</td>
<td>Insects, Mites, and Other Arthropods Affecting Plants</td>
<td>35%</td>
<td>8%</td>
<td>35%</td>
<td>8%</td>
</tr>
<tr>
<td>212</td>
<td>Pathogens and Nematodes Affecting Plants</td>
<td>0%</td>
<td>9%</td>
<td>0%</td>
<td>9%</td>
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<tr>
<td>213</td>
<td>Weeds Affecting Plants</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
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<tr>
<td>215</td>
<td>Biological Control of Pests Affecting Plants</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
<td>3%</td>
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<tr>
<td>216</td>
<td>Integrated Pest Management Systems</td>
<td>45%</td>
<td>2%</td>
<td>45%</td>
<td>2%</td>
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<tr>
<td>Total</td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

<table>
<thead>
<tr>
<th>Year: 2012</th>
<th>Extension</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1862</td>
<td>1890</td>
</tr>
<tr>
<td>Actual Paid Professional</td>
<td>8.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual Volunteer</td>
<td>6.0</td>
<td>0.0</td>
</tr>
</tbody>
</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

• 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
• Develop New Multi-Purpose Oat Varieties
• Conduct Pesticide Applicator Training Sessions
• Conduct High Tunnel Workshops
• Deliver Integrated Pest Management Resources
• Partner with the South Dakota Agri-Business Association

2. Brief description of the target audience

• Research Community
• Soybean Growers
• Wheat Growers
• Corn Growers
• Biofuels Crop Industry
• Producers
• Graduate Students
• Private and Commercial Pesticide Applicators
• Specialty Crop Growers
• Agronomy Professionals

3. How was eXtension used?

eXtension is not part of this Planned Program.

V(E). Planned Program (Outputs)

1. Standard output measures
### Direct Contacts

<table>
<thead>
<tr>
<th>2012</th>
<th>Direct Contacts Adults</th>
<th>Indirect Contacts Adults</th>
<th>Direct Contacts Youth</th>
<th>Indirect Contacts Youth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>10201</td>
<td>2234652</td>
<td>1330</td>
<td>85035</td>
</tr>
</tbody>
</table>

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

**Patent Applications Submitted**

- **Year:** 2012
- **Actual:** 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<table>
<thead>
<tr>
<th>2012</th>
<th>Extension</th>
<th>Research</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>47</td>
<td>14</td>
<td>0</td>
</tr>
</tbody>
</table>

#### V(F). State Defined Outputs

**Output Target**

**Output #1**

**Output Measure**

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>28</td>
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</tbody>
</table>

**Output #2**

**Output Measure**

- Number of Pesticide Applicator Training Sessions

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>109</td>
</tr>
</tbody>
</table>

**Output #3**

**Output Measure**

- Number of High Tunnel Workshops Conducted
<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>4</td>
</tr>
</tbody>
</table>

**Output #4**

**Output Measure**
- Number of IPM Participants

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>111</td>
</tr>
</tbody>
</table>

**Output #5**

**Output Measure**
- Number of Articles Posted on igrow Website

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>333</td>
</tr>
</tbody>
</table>

**Output #6**

**Output Measure**
- Number of Podcasts Posted on igrow Website

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>30</td>
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</tbody>
</table>

**Output #7**

**Output Measure**
- Number of Radio Programs Posted on igrow Website

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>105</td>
</tr>
</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>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of Plants and Their Systems Hatch Research Projects</td>
</tr>
<tr>
<td>2</td>
<td>Number of Pesticide Applicator Training Participants</td>
</tr>
<tr>
<td>3</td>
<td>Number High Tunnel Workshop Participants</td>
</tr>
<tr>
<td>4</td>
<td>Number of IPM Training Events Conducted</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>37</td>
</tr>
</tbody>
</table>

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 37 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 Plant Science and our Department of Biology and Microbiology. Projects include but are not limited to research studies in disease management, wheat genetics and genomics, gene mapping for soybeans, drought tolerant seeds, wine grape cultivars, oat variety development, and sunflower germplasms.

**Results**
Through research, we continue to build a scientific knowledge base to improve and understand plant varieties, increased agricultural productivity, plant diseases, impacts of tillage on soil carbon levels, and the genomic basis of grape quality. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Plant Genome, Genetics, and Genetic Mechanisms</td>
</tr>
<tr>
<td>202</td>
<td>Plant Genetic Resources</td>
</tr>
<tr>
<td>203</td>
<td>Plant Biological Efficiency and Abiotic Stresses Affecting Plants</td>
</tr>
<tr>
<td>204</td>
<td>Plant Product Quality and Utility (Preharvest)</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3000</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

   **Issue (Who cares and Why)**
   Producers planning to apply any pesticide to a commodity worth $1,000 or more must be certified as a private applicator. Anyone that applies pesticides for hire must be certified and licensed as a commercial applicator.

   **What has been done**
   SDSU Extension organized and participated in 73 commercial applicator sessions and 36 private applicator training sessions across the state. Fourteen commercial categories were covered. Speakers at the sessions included SDSU Extension Specialists, State Department of Agriculture representatives, and State Department of Environment and Natural Resources.

   **Results**
   Participants at the sessions gained knowledge in personal protective equipment, nozzle selection and calibration, pesticide resistance management and pollinator protection. Extension personnel also covered the South Dakota rules and regulations about applying pesticides. In a pre and post survey of 1000 commercial applicators, there was a 10% increase in the knowledge gained concerning the mode of action group numbers on pesticide labels.
4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>Insects, Mites, and Other Arthropods Affecting Plants</td>
</tr>
</tbody>
</table>

Outcome #3

1. Outcome Measures

Number High Tunnel Workshop 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>2012</td>
<td>51</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
South Dakotans are not eating enough fruits and vegetables. In a 2009 CDC report, South Dakota was ranked lowest in the nation of consumption of fruits and vegetables. The production of abundant fruits and vegetables is needed to improve the health of consumers. The use of high tunnels help growers increase their yields by extending the growing season.

What has been done
SDSU Extension has provided workshops to educate growers on high tunnels and other season extending methods. The workshops included high tunnel selection, science based production, construction, marketing, and pest management. One-on-one site visits were also used to disseminate information.

Results
Participants enhanced their knowledge and understanding of methods to extend the growing season of vegetables and fruits through the use of high tunnels. More than 90% of the participants indicated that they will implement at least one lesson or skill they learned at the workshops. Twenty-nine participants who do not currently utilize any season extending methods are considering acquiring and utilizing high tunnels in the near future. Participants that already use high tunnels also indicated they greatly enhanced their knowledge.
KA Code  Knowledge Area
204  Plant Product Quality and Utility (Preharvest)

Outcome #4

1. Outcome Measures

   Number of IPM Training Events Conducted

2. Associated Institution Types

   ● 1862 Extension

3a. Outcome Type:

   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

   Year  Actual
   2012  2

3c. Qualitative Outcome or Impact Statement

   Issue (Who cares and Why)
   Many factors influence how growers manage crop diseases. 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 SDSU Extension IPM Program organizes two training events for agronomy professionals annually. A crop consultants? update is held for the South Dakota Independent Crop Consultants and an IPM Field School is co-hosted with and for the SD Agri-Business Association. Thirty-six members of the South Dakota Independent Crop Consultants and more than 75 agronomists from the SD Agri-Business Association were trained in agronomic and economic areas including, soybean cyst nematode management, disease Identification of foliar and root borne diseases, timing for proper fungicide applications, new and emerging corn insects, thresholds and timing of treatment for soybean insects, herbicide timing and weed control programs, pesticide resistance management, and fertility management and agronomic/climate interactions.

   Results
   Through education and research, SDSU Extension has given professional agronomists 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. These 2 IPM events alone represent 2 million acres in South Dakota.

4. Associated Knowledge Areas
KA Code  Knowledge Area
216     Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes
● Natural Disasters (drought, weather extremes, etc.)
● Economy
● Appropriations changes

Brief Explanation

The effects of restructuring SDSU Extension in October of 2011 are likely being felt with the greatest impact during this reporting period. With the huge loss of staff and the turn-around time to hire new employees, many vacancies were created. This means less programming and less data to work with in all areas of this report.

Programming was also affected as resources had to be reappropriated to address the drought of 2012.

Funding cuts continue to impact South Dakota State University.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Due to continued budget constraints, a full-time evaluator has not been hired. However, we are diligent in our efforts to teach staff how to collect and report meaningful, useful programming data. This includes establishing baseline data, templates that correspond to NIFA reporting, and writing impacts that show strong results.

Pesticide Applicator Training

Pre- and Post-session live questionnaires were conducted using Turning Point Technologies during the commercial applicator trainings. The questionnaires were designed to measure the change in knowledge of insecticide mode of action. Specifically, the questions probed on whether the audiences understand the meaning of the group numbers on pesticide labels, where to find it on the label and how to incorporate it to a pesticide resistance management plan. In all training locations, there was a 10% increase in the knowledge gained concerning the mode of action group numbers on pesticide labels.

High Tunnel

Post survey of 51 Participants
68% - participants currently not using high tunnels
56% - participants that are considering using high tunnels as a result of the workshops
90% - participants that indicate they will implement at least one lesson or skill learned
**Integrated Pest Management**

Pre and Post Survey
75 Participants
Before
Will you scout fields and use pesticides only after pest levels reach economic thresholds?
64% - likely
28% - somewhat likely
8% - not likely
After
70% - likely
23% - somewhat likely
7% - not likely

Will you consider using aphid-resistant soybean varieties for pest management?
Before
50% - yes
50% - no
After
4% - no
96% - yes

82% - rated the events as useful to very useful

**Key Items of Evaluation**

**Pesticide Applicator Training**
1000 Commercial Applicator Participants
10% increase in the knowledge gained concerning the mode of action group numbers on pesticide labels.

**Integrated Pest Management**
10% increase in preferred IPM behavioral changes