V(A). Planned Program (Summary)

Program # 4
1. Name of the Planned Program
Global Food Security and Hunger

2. Brief summary about Planned Program

AES will focus on fundamental and applied research in breeding, nutrition, physiology, behavior, integrated resource management systems, economics, health, and range/forage management. Extension outreach will span the breadth of the topics of research to assure that industry participants have practical knowledge in modern plant, beef, dairy, and sheep production systems, biosecurity, economic and risk management, and response to policy and consumer changes. Outreach to youth involved in livestock production and judging events will continue as part of experiential learning in 4-H, FFA, and college judging.

Extension currently has Work Teams in:

1. Small Ruminants
2. Sustaining Agriculture in Colorado
3. Agriculture and Business Management
4. Beef
5. Wheat Improvement
3. Program existence:
   - New (One year or less)
   - Intermediate (One to five years)
   - Mature (More than five years)

4. Program duration:
   - Short-Term (One year or less)
   - Medium-Term (One to five years)
   - Long-Term (More than five years)

5. Expending formula funds or state-matching funds:
   - Yes
   - No

6. Expending other than formula funds or state-matching funds:
   - Yes
   - No
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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<tbody>
<tr>
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<td>Plant Genome, Genetics, and Genetic Mechanisms</td>
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<tr>
<td>202</td>
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<td>203</td>
<td>Plant Biological Efficiency and Abiotic Stresses Affecting Plants</td>
<td>1%</td>
<td></td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>Plant Product Quality and Utility (Preharvest)</td>
<td>25%</td>
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<tr>
<td>205</td>
<td>Plant Management Systems</td>
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<tr>
<td>206</td>
<td>Basic Plant Biology</td>
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<td></td>
<td>0%</td>
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<td>211</td>
<td>Insects, Mites, and Other Arthropods Affecting Plants</td>
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<td></td>
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<td></td>
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<tr>
<td>212</td>
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<td>Weeds Affecting Plants</td>
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<td>0%</td>
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<td>Integrated Pest Management Systems</td>
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<td></td>
<td>0%</td>
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<td>301</td>
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<td>10%</td>
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<td>Nutrient Utilization in Animals</td>
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<td>Animal Diseases</td>
<td>5%</td>
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<td>315</td>
<td>Animal Welfare/Well-Being and Protection</td>
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<td>10%</td>
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<tr>
<td>601</td>
<td>Economics of Agricultural Production and Farm Management</td>
<td>14%</td>
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<td>702</td>
<td>Requirements and Function of Nutrients and Other Food Components</td>
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</tbody>
</table>

|          | **Total**                                                   | 100%            | 100%            |

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Animal agriculture is a major economic sector in the United States and the leading agricultural activity in Colorado. In 2007, live meat animal sales in Colorado were valued at $4.787 billion and the value of dairy production was $516 million. Livestock and livestock products accounted for 72% of crop and livestock sales in Colorado. Remaining competitive requires that the industry produce with the most technically sophisticated systems available while considering environmental and animal welfare dimensions to maintain confidence of the consuming
Ruminant agriculture on range is the only significant agricultural enterprise which is ubiquitous in Colorado. In addition to novel and economic production practices, today's livestock producers must be knowledgeable of alternative supply chains to select a lucrative market, be aware of animal identification and trace-back requirements, understand the effects of emerging animal public health conditions, and understand the international and domestic trade environment and trends and how to respond with risk management strategies.

As recommended by NIFA reviewers, this Planned Program assumes the previously-named Animal Production Systems Knowledge Areas (KAs) and also many of those of the now differently focused Planned Program, Plant Production Systems. Together, these efforts by AES and Extension will address the Global Food Security NIFA priority.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Animals: Research in beef production management systems and nutrition is conducted on owned facilities at the Agricultural Research, Development, and Education Center (ARDEC), Eastern Colorado Research Center, Southeastern Colorado Research Center, and the Rouse Ranch in Saratoga, Wyoming. An integrated "Beef Alliance" coordinates teaching, research, and outreach in beef across all facilities focused on value-added production systems. Strong relationships exist between animal scientists and agricultural management and marketing economists. ARDEC hosts seed stock herds for Angus and Hereford, as well as a ram test. The University has several significant assets, including the Western Center for Integrated Resource Management, the Center for Genetic Evaluation of Livestock, the Congressionally sponsored National Beef Cattle Evaluation Consortium and strength in research and graduate programs in beef nutrition and breeding. The San Juan Basin Research Center conducts research and outreach on cow-calf, forage and range management systems. Livestock industry outreach includes a team of campus specialists in livestock management systems, economics, trade, policy, manure management, meat science, alternative marketing chain participation, and animal identification systems.

Plants: Successful applied crop science, environmental science, and pest management do not occur in the absence of scientists actively involved in fundamental plant and pest sciences. Colorado State has created the Cancer Prevention Laboratory (CPL) imbedded among strong programs of plant breeding and crop production research to address interactions between crop composition and human health. Professional agriculturalists and agribusiness people will require much more education in the relationships of ecosystem variables.

2. Ultimate goal(s) of this Program

Adoption of improved crop production technologies, wheat cultivars and productive and sustainable agriculture systems will assure communities, families, and individuals have enough food to eat, and that hunger is not a factor in their well-being.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program
V(F). Planned Program (Activity)

1. Activity for the Program
   - Develop improved animal production systems that are economical and environmentally sound including genetics and breeding, nutrition, and management components.
   - Develop information and methods to improve reproductive efficiency including increasing pregnancy rate, decreasing embryonic mortality and decreasing prenatal mortality.
   - Conduct extension and outreach programs to enhance animal agriculture in Colorado and the West.
   - Molecular biology and genomics of crop plants and their pests, mechanisms of biological resistance to pests, mechanisms of invasion of weed species, and understand the molecular and cellular foundations for crop improvement and crop pest management.
   - Research in genetic determinants of host plant resistance, fundamental mechanisms of biological invasions, and ecology, bio-informatics, genomics, and population genetics of pests.
   - Extension will include applied research and education relevant to emerging issues of Colorado's agricultural industries, including bio-security, safe and effective pesticide use, and implementation of effective pest management strategies that do not rely on pesticides. *Evaluate new crop, range, and livestock systems in semi-arid environments including disciplinary and interdisciplinary work in crop and soil sciences, animal sciences, pest sciences, range science, wildlife biology and ecology, forest science, water sciences, economics, and landscape design and policy applicable to the state and region.
   - Disseminate findings through extension educational programs aimed at changing practices to control pests.
   - Proper diagnosis of plant problems, entomology related to plants and structures, weed control and recommendations of integrated pest management strategies.

   • Workshops and educational classes for producers
   • Demonstration plots and field days to showcase the results
   • Individual counseling on producers specific problems
   • Conduct basic and applied research on plants, livestock, primarily beef, dairy, sheep, and horses

2. Type(s) of methods to be used to reach direct and indirect contacts

<table>
<thead>
<tr>
<th>Year</th>
<th>Extension 1862</th>
<th>Extension 1890</th>
<th>Research 1862</th>
<th>Research 1890</th>
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Extension

<table>
<thead>
<tr>
<th>Direct Methods</th>
<th>Indirect Methods</th>
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</thead>
</table>
3. Description of targeted audience

Individual agricultural producers, commodity groups, agri-business partners

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) to be reached through direct and indirect contact

<table>
<thead>
<tr>
<th>Year</th>
<th>Direct Contact Adults</th>
<th>Indirect Contacts Adults</th>
<th>Direct Contacts Youth</th>
<th>Indirect Contacts Youth</th>
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<td>5000</td>
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<tr>
<td>2016</td>
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</table>

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

2012: 0  2013: 0  2014: 0  2015: 0  2016: 0

3. Expected Peer Review Publications

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<tr>
<td>2016</td>
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V(H). State Defined Outputs

1. Output Target

- Number of attendees at workshops/trainings/field days
  
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- Amount of grant dollars garnered to support animal research and outreach programs
  
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- Number of workshops presented.
  
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</thead>
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<td>50</td>
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</tbody>
</table>

- Number of volunteers supporting this work
  
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</thead>
<tbody>
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<td>200</td>
<td>200</td>
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</table>

- Number of agencies partnering in this program effort.
  
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<thead>
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### V(I). State Defined Outcome

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<tr>
<td>1</td>
<td>Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained</td>
</tr>
<tr>
<td>2</td>
<td>Percent of participants indicating change in behavior/ best practices adopted</td>
</tr>
<tr>
<td>3</td>
<td>Economic impact of the change in behavior reported, reported in dollars</td>
</tr>
<tr>
<td>4</td>
<td>Number of new technologies adopted to increase food production</td>
</tr>
</tbody>
</table>
Outcome # 1

1. Outcome Target

Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained

2. Outcome Type:

- Change in Knowledge Outcome Measure
- Change in Action Outcome Measure
- Change in Condition Outcome Measure

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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<td>60</td>
<td>60</td>
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</tbody>
</table>

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection
- 601 - Economics of Agricultural Production and Farm Management
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research
Outcome # 2

1. Outcome Target

Percent of participants indicating change in behavior/ best practices adopted

2. Outcome Type :

- Change in Knowledge Outcome Measure
- Change in Action Outcome Measure
- Change in Condition Outcome Measure


3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
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- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection
- 601 - Economics of Agricultural Production and Farm Management
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research
Outcome # 3

1. Outcome Target

Economic impact of the change in behavior reported, reported in dollars

2. Outcome Type:

- Change in Knowledge Outcome Measure
- Change in Action Outcome Measure
- Change in Condition Outcome Measure

<table>
<thead>
<tr>
<th>Year</th>
<th>Outcome</th>
<th>Target</th>
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<td>2015</td>
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<td>100000</td>
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<tr>
<td>2016</td>
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</table>

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
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- 307 - Animal Management Systems
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection
- 601 - Economics of Agricultural Production and Farm Management
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- ✔ 1862 Extension
- ✔ 1862 Research
Outcome #4

1. Outcome Target

Number of new technologies adopted to increase food production

2. Outcome Type:

- Change in Knowledge Outcome Measure
- Change in Action Outcome Measure
- Change in Condition Outcome Measure

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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</table>

3. Associated Knowledge Area(s)

- ☑ 201 - Plant Genome, Genetics, and Genetic Mechanisms
- ☑ 204 - Plant Product Quality and Utility (Preharvest)
- ☑ 205 - Plant Management Systems
- ☑ 211 - Insects, Mites, and Other Arthropods Affecting Plants
- ☑ 215 - Biological Control of Pests Affecting Plants
- ☑ 216 - Integrated Pest Management Systems
- ☑ 301 - Reproductive Performance of Animals
- ☑ 601 - Economics of Agricultural Production and Farm Management
- ☑ 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- ☑ 1862 Extension
- ☑ 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

Report Date 06/23/2011
☑ Natural Disasters (drought, weather extremes, etc.)
☑ Economy
☑ Appropriations changes
☑ Public Policy changes
☑ Government Regulations
☐ Competing Public priorities
☑ Competing Programmatic Challenges
☐ Populations changes (immigration, new cultural groupings, etc.)
☐ Other

Description

Individuals’ ability to attend fee-for-service programs may be impacted by economic downturns. Extension’s ability to provide programming and scholarships for these programs may be impacted if appropriations continue to decrease and staff is lost. Inclement weather may impact an individual producer’s ability to remain viable. Government subsidy programs may impact the viability of an individual producer. Availability of funding for research programs will govern magnitude and scope of program.

The threat of impending farm crises including credit, land values, low commodity prices, weather (wind, temperatures, and rain), etc. may affect evaluation results.

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

1. Evaluation Studies Planned

☑ After Only (post program)
☐ Retrospective (post program)
☑ Before-After (before and after program)
☑ During (during program)
☐ Time series (multiple points before and after program)
☑ Case Study

☐ Comparisons between program participants (individuals, group, organizations) and non-participants
☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
☐ Comparison between locales where the program operates and sites without program intervention
☐ Other

Description

Regular pre-post evaluations are used. Formative evaluations are often used during programs to adjust focus and direction. Case studies are used to clearly demonstrate impact. NIFA reviewers’ and stakeholders’ request for longer-term evaluation strategies must be considered in light of the rigor required for such studies, and the existence of multiple variables outside the scope of AES research and/or Extension activities.
2. Data Collection Methods

☑ Sampling
☐ Whole population

Survey (Mail, Telephone, On-Site).
☐ Mail
☐ Telephone
☐ On-Site

Interview
☐ Structured
☐ Unstructured
☑ Case Study
☑ Observation
☐ Portfolio Reviews
☑ Tests
☐ Journals
☐ Other

Description

Pre-post tests. Standard survey methods are the usual protocol for Extension evaluation.