V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Agricultural Productivity and Food Security

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	5%		3%	
102	Soil, Plant, Water, Nutrient Relationships	5%		5%	
104	Protect Soil from Harmful Effects of Natural Elements	5%		3%	
111	Conservation and Efficient Use of Water	8%		7%	
112	Watershed Protection and Management	5%		3%	
121	Management of Range Resources	2%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	6%		10%	
202	Plant Genetic Resources	0%		9%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		10%	
205	Plant Management Systems	2%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		7%	
212	Pathogens and Nematodes Affecting Plants	10%		9%	
213	Weeds Affecting Plants	10%		3%	
215	Biological Control of Pests Affecting Plants	5%		5%	
216	Integrated Pest Management Systems	10%		4%	
301	Reproductive Performance of Animals	2%		3%	
302	Nutrient Utilization in Animals	2%		3%	
303	Genetic Improvement of Animals	3%		2%	
304	Animal Genome	0%		2%	
604	Marketing and Distribution Practices	5%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	145.0	0.0	290.0	0.0
Actual Paid Professional	98.0	0.0	345.3	0.0
Actual Volunteer	27.0	0.0	0.0	0.0

2. Institution Name: Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1666157	0	2157767	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1666157	0	2157767	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
8894072	0	42622179	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Production agriculture is one of the primary Research and Extension areas of emphasis at Washington State University. We view the ability to maintain a safe, high quality, and growing food supply as our most diverse and active of the planned programs. Virtually everything that we do under the heading of production agriculture and farm to table programs has some component included in this program. This rationale is based on the idea that knowledge gained about plant and animal production systems contributes to the world food supply and often can be adapted to increase food availability and stability in areas far from Washington state. Thus work in Departments like Crop Science, Horticulture, the Institute of Biological Chemistry and Animal Science are included, as are research and extension programs in areas such as Entomology and Plant Pathology. Since having production systems that are economically viable is essential, we also include Agricultural Economics in this Planned Program and research and extension that is related to food processing and distribution. We also include efforts that directly relate to issues such as the availability of labor and the dynamics of communities that are not covered by other Planned Programs.

To accomplish the work included in this Planned Program, fundamental, translational, and applied research is conducted in laboratories on our main campus, at Research and Extension centers, and in collaboration with growers, ranchers, food processors, and other related individuals and entities. Extension programs serve many roles in this Program. Through the outreach and survey activities of Extension, many of the issues are defined and articulated in a form that allows us to take direct action. We strive to identify the scope of a problem, define and identify solutions, determine the resources available, and decide on a course of action, Action plans could range from an investigation of the literature to carrying out primary research that would identify and validate solutions. Extension is almost always involved in testing the application of partial solutions and ultimately is charged with developing their mechanisms for

implementing potential solutions if it appears that something suitable has been found to deal with the identified problem. Detailed information about the WSU projects is available through the CRIS reporting system. As an index of external grant funding competitiveness, the ARC obtained ~$43 million in new award commitments in CY 2013, a large fraction of which was in areas covered in this Program.

As is implied in the above description, the dynamics of problem solving in this area is complex. There are many different targets for specific solutions but they can generally be characterized by the boundary conditions of trying to improve the efficiency or cost effectiveness of production, processing or distribution, trying to increase consumer and stakeholder satisfaction, and trying to anticipate issues that might arise in the future that would keep the new ideas from being sustainable, in the sense that they can be applied indefinitely without adverse consequences. This latter issue often leads to parts of a project being assigned to another Program. If, for example, a specific constraint on production is related to weather or changing climate, some fraction of the effort will be assigned to the Program on Climate Change.

2. Brief description of the target audience

Target audiences include farmers and ranchers, agricultural consultants, scientists, commodity commissions, educators, state and federal agency professionals, elected officials, food processors, transporters, agricultural chemical producers and applicators, and the general public.

3. How was eXtension used?

Three faculty members were engaged in Communities of Practice to advance collaborative efforts and facilitate research-based information sharing through the eXtension system.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	125179	3487425	5026	16627

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

Patent Applications Submitted

Year:	2013
Actual:	3

Patents listed

WA8074 ('Glee') Hard Red Spring Wheat. Michael Pumphrey. Hard red spring wheat. Awned, semi-dwarf, white straw, white glumes, and early to mid-season maturity. Broadly adapted to a wide range of production regions across eastern Washington, northern Idaho and northern Oregon. Performs particularly well in areas receiving >500mm average annual precipitation and/or subject to moderate or severe stripe rust pressure. Superior high-temperature adult-plant resistance to stripe rust, and resistance to local biotypes of Hessian fly. Milling and baking properties are equivalent to Tara 2002, Scarlet, and Hank. 1259-U2RF-OC United States 201300129 2013-01-30

WA8092 ('Otto') Soft White Winter Wheat. Stephen Jones and Arron Carter. Semi-dwarf, soft white winter wheat with late-season maturity, common head type, and white straw and glumes, Adapted for production in the semi -arid region <12 inches average annual precipitation) of eastern Washington as a replacement/ complement for 'Eltan' and 'Xerpha', Otto inherited the Pchl gene for foot rot resistance, based on the SSR markers Xorwl, Xorw5 andXor1l'6, from the parent 'Madsen', Otto also has snowmold and dwarf bunt resistance similar to that of the parent Eltan, Otto has non-race specific HT AP stripe rust resistance at a level equal to that of the variety Madsen and higher than that of Eltan, End-use quality performance is a significant improvement compared to Eltan, Madsen and Xerpha. 1231-U2RF-OC United States 201300360 2013-05-14

WA8123 ('Dayn') Hard White Spring Wheat. Michael Pumphrey. Semi-dwarf, hard white spring wheat with early-medium maturity, white straw and white glumes. Broadly adapted with superior high-temperature adult-plant resistance to stripe rust, good test weight, above average protein content, and excellent yield potential in high rainfall and irrigated production areas. Susceptible to local biotypes of the Hessian fly. Milling and baking qualities are equivalent to Otis and superior to that of BR7030. 1316-U2RF-OC United States 201300130 2013-01-30

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	43	277	320

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, demonstrations, and field days conducted annually

Year	Actual
2013	1620

Output #2

Output Measure

- Number of peer reviewed (official) WSU Extension publications published

Year	Actual
2013	43

Output #3

Output Measure

- Number of graduate students with a significant professional orientation in the area of Global Food Security.

Year	Actual
2013	175

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied acquired knowledge
3	Percentage increase in yield realized among program participants as a result of application of WSU-recommended practices.
4	Increase in profitability resulting from practices developed by or recommended by WSU Extension personnel and/or ARC scientists.
5	Increased number of acres managed with "Best Management Practices" designed to yield improved environmental quality.
6	Number of acres impacted by WSU research and extension programs that enhanced productivity, efficiency, or sustainability of crop production enterprises
7	Number of food production animals impacted by WSU research and extension programs that enhanced productivity, efficiency, or sustainability of livestock and dairy production enterprises.
8	Number of food processing facilities or direct marketing enterprises that enhanced processing, marketing, or overall efficiency of food distribution.

Outcome #1

1. Outcome Measures

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	69

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State's diverse microclimates produce over 300 crops, including small grains, vegetables, fruits, legumes, and livestock. Washington State University (WSU) conducts research and extension programs focused on increasing the productivity and efficiency of our farms and ranches by reducing plant and animal pests and diseases, developing new genetic resources, and optimizing overall food production practices and strategies.

What has been done
Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences

Results
This outcome documents that 69% of program participants increased their knowledge and skill through participation in one or more of over 1,600 educational events focused on enhancing agricultural productivity and food security for the benefit of producers and consumers alike.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water

112	Watershed Protection and Management
121	Management of Range Resources
202	Plant Genetic Resources
205	Plant Management Systems
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
303	Genetic Improvement of Animals

Outcome #2

1. Outcome Measures

Percentage of participants evaluated who applied acquired knowledge

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	57

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State's diverse microclimates produce over 300 crops, including small grains, vegetables, fruits, legumes, and livestock. Washington State University (WSU) conducts research and extension programs focused on increasing the productivity and efficiency of our farms and ranches by reducing plant and animal pests and diseases, developing new genetic resources, and optimizing overall food production practices and strategies.

What has been done
Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved 1620 workshops, clinics, seminars, field days, field demonstrations, and educational events. These events were supplemented with print and electronic publications, mass

media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
This outcome documents that 57% of program participants utilized the research-based information and training provided through this planned program to enhance productivity, efficiency, risk management, or sustainability of crop and livestock systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
202	Plant Genetic Resources
205	Plant Management Systems
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
303	Genetic Improvement of Animals

Outcome #3

1. Outcome Measures

Percentage increase in yield realized among program participants as a result of application of WSU-recommended practices.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Increase in profitability resulting from practices developed by or recommended by WSU Extension personnel and/or ARC scientists.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increased number of acres managed with "Best Management Practices" designed to yield improved environmental quality.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of acres impacted by WSU research and extension programs that enhanced productivity, efficiency, or sustainability of crop production enterprises

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	7164989

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State's diverse microclimates produce over 300 crops, including small grains, vegetables, fruits, legumes, and livestock. Washington State University (WSU) conducts research and extension programs focused on increasing the productivity and efficiency of our farms and ranches by reducing pests and diseases, developing new genetic resources, and optimizing overall food production practices and strategies.

What has been done
Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
WSU research and extension programs directly contributed to enhanced productivity, efficiency, and sustainability of food production on 7,164,989 acres of the 15,000,000 acres of agricultural land in the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
121	Management of Range Resources
202	Plant Genetic Resources
205	Plant Management Systems
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

Outcome #7

1. Outcome Measures

Number of food production animals impacted by WSU research and extension programs that enhanced productivity, efficiency, or sustainability of livestock and dairy production enterprises.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2803111

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State's livestock industry includes a diverse mix of dairy, beef, swine, sheep, and

goat enterprises. These enterprises range from small farms to very large cooperative farms with thousands of animals under management. Washington State University's research and extension programs continue to provide reliable information and training beneficial to the sustainability of these farms and food animal production.

What has been done
Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
This planned program directly impacted the management of 2,803,111 food animals, through dissemination of research information and training for producers to enhance risk management strategies, herd health, reproductive efficiency, meat quality, feeding management, grazing management, and a variety of other management and animal husbandry practices important for sustainable animal agriculture enterprises.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals

Outcome #8

1. Outcome Measures

Number of food processing facilities or direct marketing enterprises that enhanced processing, marketing, or overall efficiency of food distribution.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	288

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food processing and marketing are essential components of a food system that provides food security. In addition to the importance of large scale food processing operations; on-farm processing and direct marketing of locally grown food is increasingly in high demand.

What has been done
This work included a series of outreach and training methods that included workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences. Program offerings were customized for each audience, ranging from midsize, commercial processing plants to farmers market associations and direct farm marketers.

Results
288 small to mid-size enterprises were provided training and assistance resulting in improvements to processing efficiency and improved distribution of locally grown foods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
212	Pathogens and Nematodes Affecting Plants
604	Marketing and Distribution Practices

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities

Brief Explanation

Although many factors impact the sustainability of agricultural enterprises and food production, our primary goals of providing training and research-based information to target audiences was primarily impacted by reduced or uncertain funding from federal, state, and local sources. State funding support for the university and Extension was stable in 2013; but federal capacity funding was reduced and uncertainty of future funding levels during the year impacted our decisions on hiring and deployment of human and financial resources. Our work in research and extension is increasingly dependent on securing competitive grants to support our system and drive our programs forward. Competing priorities for limited funds and financial resources continue to be our most limiting factor.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

This program encompassed a wide array agricultural enterprises including irrigated

and dry-land agronomic crops, high value horticultural crops, fruit orchards, vine crops, grazing lands, livestock operations, and dairy farms. The overall program evaluation for all events and projects under this program theme was evaluated in terms of "knowledge gained by participants" and "application of this knowledge" to address agricultural productivity and food security. Additionally, we collected data on the acreage of agricultural land and livestock numbers that directly benefited from our work. We also reported the number food processing facilities, direct marketing enterprises, and food banks that enhanced efficiency of food processing and distribution. Collectively, the results indicate positive impacts to agricultural productivity through the dissemination of research-based information and the application of this knowledge for sustaining agricultural enterprises and food production. Results were collected through a variety of methods including pre and post event evaluations, surveys, agricultural statistics, feedback from stakeholder groups, and other assessments of program participants. The analysis provided the aggregate results indicated below under key items of evaluation.

Key Items of Evaluation

This planned program focused on increasing agricultural productivity, food processing efficiency, and food distribution as a means of enhancing food security though a sustainable system. Our assessments indicated that 69% of program participants increased their knowledge relative to the knowledge areas covered, and 57% indicated application of one or more principles or practices learned from their participation. The aggregate outcomes of this work impacted 7,164,989 acres for farm land, and 2,803,111 head of livestock. This work also supported enhancements to 288 enterprises associated with food processing, direct marketing, and food distribution.