V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Global Food Security and Hunger

☑ 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
102	Soil, Plant, Water, Nutrient Relationships	9%		5%	
111	Conservation and Efficient Use of Water	7%		5%	
121	Management of Range Resources	11%		0%	
202	Plant Genetic Resources	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	9%		15%	
205	Plant Management Systems	9%		5%	
206	Basic Plant Biology	0%		5%	
216	Integrated Pest Management Systems	6%		5%	
301	Reproductive Performance of Animals	5%		10%	
302	Nutrient Utilization in Animals	3%		0%	
307	Animal Management Systems	9%		0%	
311	Animal Diseases	0%		15%	
501	New and Improved Food Processing Technologies	5%		0%	
502	New and Improved Food Products	6%		10%	
601	Economics of Agricultural Production and Farm Management	5%		10%	
602	Business Management, Finance, and Taxation	7%		0%	
603	Market Economics	3%		0%	
903	Communication, Education, and Information Delivery	6%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	60.0	0.0	75.0	0.0
Actual Paid	71.9	0.0	32.0	0.0
Actual Volunteer	1461.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1520495	0	2139011	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1520495	0	13693150	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2965243	0	26110507	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Organic, value-added, and technological (bio-based, information-centered, robotic, nanotechnology, etc.) approaches complement conventional agriculture. By utilizing contemporary research tools in agronomy, animal or soil science, plant nutrition and pest management, and molecular or genetic techniques, this program will develop improved practices for crop and animal production systems. New or enhanced techniques and information will enhance the potential use of alternative crops, reduce soil erosion, reduce the economic, social, and environmental costs of crop pests, and maintain or increase soil biological, chemical and physical properties. New knowledge will reduce disease, wastes and discharges in animal systems while improving husbandry, productivity and food safety.

Research and extension will also look at key areas of various social changes in the marketplace impacting producers, retailers and consumers. The research aims to determine (1) how technology impacts producers/retailers/consumers in the market place; (2) how society impacts consumer demand for goods and services with a goal of improving the well-being of consumers; and (3) how to develop economic linkages among producers, retailers, and consumers for the community development.

In addition, a broad coalition of agricultural, environmental and food groups has coalesced around the need for integrated efforts for sustainable agriculture and food systems information, research, and education. Outcomes include more economically and ecologically sustainable farms and ranches; a more resilient rural economy; stronger bonds between rural, urban, and periurban residents; and a healthier environment for all Oregonians.

- Conduct Research Experiments.
- Conduct surveys
- Conduct Workshops, Meetings.
- Deliver Services.

- Develop Products, Curriculum, Resources.
- Provide Training.
- Provide Demonstrations
- Provide Counseling.
- Assessments.
- Work with Media.
- Partnering
- Facilitating.

2. Brief description of the target audience

- Professional peers and scientific communities, veterinarians, vaccine producers
- State commodity commissions, grower groups, packers, crop consultants
- Natural resource industry clientele - growers, field representatives, grower co-ops and partnerships, processors and handlers, export companies, importing companies
- County, state and federal agencies - USDA-ARS, Oregon Department of Agriculture, Natural Resources Conservation Service, Bureau of Indian Affairs, Confederated Tribes of the Umatilla Indian Reservation, US Forest Service, and Bureau of Land Management.
- Policy makers, public health officials, and community leaders
- Teachers and students, and other educators
- Genetic companies
- Nutritional consultants
- Nonprofit conservation groups and ecologists
- General public and consumers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5451	3469	2397	3276

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

Patent Applications Submitted

Year:	2014
Actual:	1

Patents listed
Interspecific Hybrid Bermudagrass (Cynodon transvaalensis >C. dyctylon

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	66	41	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Conference Presentations

Year	Actual
2014	29

Output #2

Output Measure

- Number of Courses Developed that include the Planned Program and State Defined Outcomes as part of the curriculum

Year	Actual
2014	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improved and sustainable plant and animal production systems, including precision systems, cultural practices, conservation and population management strategies, innovations, pest control, organic systems, better fertility and reduced uterine infections in dairy and beef cattle and sheep, as well as better understanding of reproductive genetics and developmental biology
2	Expanded nutrient knowledge in plant and animal systems
3	Improved plant and animal breeding for improved or novel attributes and for human health benefits, including fertility, health, productivity
4	Develop optimum pest management by identifying factors affecting herbicide activity, registering herbicides, controlling weeds in organic and no-till production; learning basic pest biology, registering new pesticides, finding application rates, and identifying risks associated with a pest as it becomes established
5	Conduct economic studies to help Producer groups learn about factors shaping global markets and productivity-convergence effects on US agricultural and processed food production and trade
6	Number of growers (commercial, small and fresh market) that adopt new varietals and methods to reduce yield losses and expenses, rejuvenate orchards, achieve better productivity and efficiency, provide environmental benefits (less fungicide applications, etc.), and effectively compete on the world market
7	Number that adopt conservation strategies and practices
8	Number in improved agricultural and fisheries/aquaculture sectors, e.g., commodities
9	Number of policy makers and other stakeholders that are better informed about plant or animal production methods, technologies, and mnanagement techniques.
10	Improved knowledge of consumer and market conditions and factors that affect business survival and competitiveness such as market conditions, process map, business management, types of consumers and their food choices, motivations for food choice, marketing approaches for local markets and community food systems
11	Improved information about biology, control and resistance of viral, bacterial, fungal diseases, especially disease reproduction, transport and spread; postharvest decay; models to predict risk; and relationships between disease susceptibility and disease resistance
12	Produce the next generation of growers and agricultural eduactors by integrating agricultural education into high school curriculums and community education
13	Number whose consumer business knowledge leads to improved opportunities, and more successful starts, activity, survival, and profitability in food enterprises, as well as new and improved value-added products
14	Improved animal health

Outcome #1

1. Outcome Measures

Improved and sustainable plant and animal production systems, including precision systems, cultural practices, conservation and population management strategies, innovations, pest control, organic systems, better fertility and reduced uterine infections in dairy and beef cattle and sheep, as well as better understanding of reproductive genetics and developmental biology

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
White mold is a serious foliar and pod disease of snap beans grown for processing in western Oregon as well as in all major snap bean production regions in the US. Fields with > 6% infected bean pods are rejected by the processor, resulting in a complete crop failure. Ronilan (vinclozolin, a Class B1/B2 carcinogen), a highly effective fungicide used through 2005 for the control of both white and gray mold is no longer available to conventional bean growers. Alternative WM management is the top research need identified by conventional snap bean growers. White mold is also a serious disease on other vegetable crops including squash, peppers, cauliflower, broccoli, and potato."

What has been done
This project analyzed four separate research objectives: 1) Evaluate the cumulative impact on disease severity of applying low rate Contans applications to each of 4 crops in a two year double-crop vegetable rotation 2) Evaluate the impact on white mold disease severity of low rate Contans applications combined with a moderately resistant bean cultivar 3) Evaluate the impact on white mold disease severity and sclerotial Cm infection of applying Contans through the irrigation system during snap bean bloom, with and without at-bloom conventional foliar fungicide applications. 4) Evaluate the economics of Contans use in snap bean and vegetable rotations.

Results

The strategies to be evaluated in this proposal would may reduce inoculum potential and bean susceptibility. If effective, these strategies would become additional tools in the overall disease and risk management toolbox. Conventional snap bean farmers are participating in sustainability certification programs requiring progress in bio-intensive IPM. A small group of processed vegetable farmers are interested in growing snap beans organically. Diversified organic vegetable farmers grow many crops that are hosts to white mold, including carrots, peppers, cabbage family crops, squash, lettuce, beans, and peas. Because the host range is so wide, organic farmers growing a diversity of crop species find it difficult to rotate out of host crops for 4 years. These farmers require an organic white mold management toolbox. This project's main goal is to evaluate and demonstrate the integration of a biological control agent into a multi-tactic mold management plan for both conventional and organic farmers, including cultural practices, resistant germplasm, and where appropriate, fungicides. This project has the potential to reduce costs and improve environmental quality and human health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #2

1. Outcome Measures

Expanded nutrient knowledge in plant and animal systems

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Meadowfoam (Limnanthes alba Benth.) is a new oil seed crop native to the Pacific Northwest. The stable, long chain fatty acids in the oil have unique physical and chemical properties that are valued in the cosmetic industry. The oil also has potential as a raw material in biolubricants, waxes and polymers. Degradation products from glucosinolates in the seed meal have been shown to have biopesticidal properties, and development of commercial outlets for the seed meal would add considerable value to the crop. On a national level, this research addresses the need for renewable sources of industrial chemicals and crop diversification. On a local level, meadowfoam plays a vital role as a winter annual rotation in grass seed cropping systems.

What has been done

Meadowfoam (Limnanthes alba Benth.) is a new oil seed crop native to the Pacific Northwest. The stable, long chain fatty acids in the oil have unique physical and chemical properties that are valued in the cosmetic industry. The oil also has potential as a raw material in biolubricants, waxes and polymers. Degradation products from glucosinolates in the seed meal have been shown to have biopesticidal properties, and development of commercial outlets for the seed meal would add considerable value to the crop. On a national level, this research addresses the need for renewable sources of industrial chemicals and crop diversification. On a local level, meadowfoam plays a vital role as a winter annual rotation in grass seed cropping systems.

Results

To regenerate seed for future trials and breeders seed increases, experimental varieties MF189, MF190, MF191, MF192, and MF197 were produced in isolated field plots in collaboration with the OMG Meadowfoam Oil Seed Growers Cooperative. The OMG assists the breeding project at OSU to identify growers' fields for seed increases and to refine selection criteria to meet grower and end-user needs and priorities. OSU scientists present research findings at the annual OMG meeting and participate in OMG field days. New crop cultivars and bioproducts developed through this project are made available through the OMG network for rapid dissemination and adoption by growers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems

601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Improved plant and animal breeding for improved or novel attributes and for human health benefits, including fertility, health, productivity

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The mechanisms of hormonal regulation of seed dormancy and germinaiton have been analyzed, using genetic, genomic, molecular, and biochemical techniques. A positive feedback mechanism in the abscisic acid pathway was discovered from Arabidopsis seeds.

What has been done
The results from the Arabidopsis experiments are being replicated for several wheat varieties and dependent upon available funding, may be expanded to other problematic cereal grains.

Results
The foundationn of the technology, which prevents precocious germination, such as preharvest sprouting (PHS) in wheat, was established. This technology has potential to be applied to many crop species. Wheat growers suffering from PHS issues will benefit from this technology when it is transferred to wheat.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Develop optimum pest management by identifying factors affecting herbicide activity, registering herbicides, controlling weeds in organic and no-till production; learning basic pest biology, registering new pesticides, finding application rates, and identifying risks associated with a pest as it becomes established

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Tan spot of wheat is a serious disease of world-wide, economic importance caused by the fungus, Pyrenophora tritici-repentis. Yield losses up to 50% have been reported in the US and Canada. Increases in disease incidence are due to changes in cultural practices including, shorter rotations and continuous wheat cultivation, growth of highly susceptible cultivars, and change from stubble burning to its retention. Pathogenicity (virulence) of this pathogen is dependent on the production of multiple, host selective toxins. As part of our ongoing effort to understand disease compatibility, and control tan spot of wheat, we are systematically characterizing the toxins produced by this pathogen and attempting to understand how they influence the host. Molecular evaluation of tan spot of wheat will not only provide outcomes that could be exploited for control of this wide-ranging and serious disease, but a disease interaction that also has the potential to become a "model"system for understanding virulence and disease susceptibility (compatibility).

What has been done
The experimental component for the microarray studies on genes expressed in ToxA- and mock-treated leaves has been completed. The quality of microarray data was analyzed using standard tools implemented in the Bioconductor packages simpleaffy and affyPLM. All microarrays were normalized together using RMA. Differentially expressed probesets were identified using four methods: PaGE, SAM, LIMMA, and BRAT.For gene identification a new annotation for the Wheat GeneChip was obtained. The Wheat GeneChip probesets were re-annotated by aligning the probeset targets to current wheat cDNAs, transcript assemblies and ESTs (http://plantta.tigr.org/) using BLAT. When available the annotations of the wheat sequences were retained. Otherwise the corresponding wheat sequences were mapped to their best match in the rice proteome (TIGR v5) using blastx. The descriptive and GO annotations of the best-matching rice protein were assigned to the wheat sequence (Manuscript in Preparation). Ptr ToxB experiments are in progress.

Results
Given that ToxA sensitivity is dependent on a single gene and that the product of this gene mediates toxin uptake, our results suggest that once internalized, the ToxA site-of-action is common to at least all wheat plants and likely common to all plants. This inference is supported by our previous findings that transient expression of ToxA in wheat leads to necrosis even in wheat genotypes that are not normally toxin-sensitive. Further, transient expression of ToxA in plants, which do not exhibit naturally occurring toxin sensitivity such as tobacco and barley also lead to necrosis. Thus, the internal site of ToxA action appears to be common to all plants. Using BSMV-induced gene silencing (VIGS), we have found that silencing of ToxABP1 leads to a severe chlorotic phenotype, partially recapitulating the effects of ToxA. Therefore, cumulative data strongly implicate that ToxA interacts with ToxABP1 and this interaction is biologically significant. Our current hypothesis is that ToxA interaction with ToxABP1 would disrupt PS II function leading to oxidative stress.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #5

1. Outcome Measures

Conduct economic studies to help Producer groups learn about factors shaping global markets and productivity-convergence effects on US agricultural and processed food production and trade

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate change researchers project that fall and winter rainfall will increase in the Pacific Northwest. These changes pose interesting management decisions for wheat farmers in the low rainfall regions of the Pacific Northwest.The general trend toward increased winter precipitation increases the possibility of successfully planting on an annual basis within the 12- to 18-inch precipitation zone. Some farms within this zone already successfully plant on an annual basis and are interested in adding diversity to their operations by adding peas or biofuel crops such as canola and camelina into their rotations.

What has been done
University research and Extension faculty, industry representatives, and agricultural lenders were consulted to obtain current loan and balance sheet information, along with expected future yields and prices for winter wheat, spring dry peas, winter canola, and camelina over a 10-year period. This information was inputted into the AgToolsTM software to conduct an economic assessment of the various cropping rotation options to determine how changes in input and output costs and changes in projected debt-to-asset ratios would impact the financial position of this representative farm in the future. Three alternative crop rotations were considered: winter wheat followed by dry peas, winter wheat followed by canola, and winter wheat followed by camelina. The cash flow was estimated for each of the owned and leased fields on the farm to project net income on the farm.

Results
From a profitability perspective, a continuous winter wheat and canola cropping system was the most profitable across all field types on the farm. The second most profitable system on the north and east fields was winter wheat and camelina, while winter wheat after dry peas fared slightly better on the leased south and west fields. Looking at the feasibility of each cropping system on a whole-farm basis, the winter wheat following canola cropping system generated higher net incomes, lower debt-to-asset ratio, and higher current ratios over the 10 years. Thus, the additional investment in machinery to switch to a continuous cropping system of winter wheat and canola would generate higher profits for this farm then their current practices.

As shown by this example, AgToolsTM provides a useful decision tool for growers. It allows them to better understand financial and planting options, as well as associated impacts to farm

profitability under uncertain future climates, technologies, and prices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #6

1. Outcome Measures

Number of growers (commercial, small and fresh market) that adopt new varietals and methods to reduce yield losses and expenses, rejuvenate orchards, achieve better productivity and efficiency, provide environmental benefits (less fungicide applications, etc.), and effectively compete on the world market

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this project is to develop new weather forecasting decision support tools that can extend the forecast horizon used by agricultural producers in planning multiple management activities, especially those involving crops and pests, that are affected by the weather. Our specific objectives are to: 1. Develop, calibrate, and verify downscaled NOAA NWS 15, 30, and 90 day forecast anomaly grids as daily temperature and precipitation forecasts for multiple IPM and crop management modeling products. 2. Implement, extend, support, and validate the new medium- and extended-term forecasts to serve a variety of IPM challenges including for insects, plant diseases, and for invasive species pest event maps. 3. Document and evaluate adoption and usage of the forecast systems and provide opportunities for further integration into US IPM decision support modeling infrastructures.

What has been done

Much of the effort for this project involves data processing to convert NWS 8-14, 15-45, and 46-105 day forecast "outlook anomalies" (deviations from 30-year normals) into formats that can be used in a wide array of pest and crop models. First, we will perform statistical conversion from NWS outlook anomalies that are expressed as probabilities above or below normal into actual values of temperature and rainfall in degrees F. and inches rainfall. Second, we will blend, smooth and interpolate the forecasts for the three intervals into daily values. Our team of crop modeling, weather forecasting, mathematical, and statistical experts will devise and evaluate the procedures needed for the conversions. Two types are needed, "smoothed temperature" forecasts that look similar to adjusted 30-year normal data, and "realistic rainfall pattern" forecasts that are generally produced by weather generator programs used to drive crop growth models. We will perform calibration and rescaling exercise to produce the proposed data types, and verify that these two approaches work as intended using archival forecast and weather data, and will document error rates as forecast skill, difference from forecast vs. observed degree-day (temperature heat unit) accumulations, and days prediction error for selected agricultural pest events such as first adult emergence. We will use geographic information systems (GIS) analysis and PRISM climate maps to spatialize the forecasts to a high spatial resolution of ca. 800 meters for the full continental US. These extended forecasts will then be matched to all available public weather stations (at least 16,000 stations in U.S. at last count), for virtual weather station locations (which use interpolated data to create virtual weather stations) and be available as GIS data grids for degree-day mapping needs.

Results

Outcomes are anticipated to include greater adoption of best management practices including temperature and moisture-driven models for agricultural decision making, more informed data-driven pest management decisions, a greater understanding and acceptance of extended-range weather forecasts as impacted by climate change, greater understanding of how the weather drives pest activities, leading to more informed consideration of risks and trade-offs of multiple pest control tactics, and a more strategic approach to farm management. This should also include less reliance on calendar-based management practices and more sustainable production practices, and more efficient timing of pest control measures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
903	Communication, Education, and Information Delivery

Outcome #7

1. **Outcome Measures**

Number that adopt conservation strategies and practices

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Number in improved agricultural and fisheries/aquaculture sectors, e.g., commodities

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Number of policy makers and other stakeholders that are better informed about plant or animal production methods, technologies, and mnanagement techniques.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2014	0

3c. **Qualitative Outcome or Impact Statement**

Issue (Who cares and Why)
Special interest groups are increasingly focusing on policy regarding plant and animal production systems. This often leads to adversarial policies that limit the use of conventional or newly developed technologies that can improve production systems. This project seeks to provide better information to special interests and policy makers about these systems.

What has been done

This project is still in the development phase and preliminary results are expected next year.

Results
Nothing to report

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
121	Management of Range Resources
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
311	Animal Diseases
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #10

1. Outcome Measures

Improved knowledge of consumer and market conditions and factors that affect business survival and competitiveness such as market conditions, process map, business management, types of consumers and their food choices, motivations for food choice, marketing approaches for local markets and community food systems

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The proposed research will addresses organic blackberry production in the northwestern and southern USA (represent 91% of US acreage). There is a strong, emerging market for fresh and processed organic blackberry fruit, yet a lack of information on.suitable organic production systems. Growers interested in the processed blackberry market have questions as to whether labor-saving machine harvesting technology can be used in organic systems when even beneficial insects could be harvest contaminants. Machine-harvested fruit are thought to be of more uniform ripeness and of better sensory quality than hand harvested fruit, although this has not been proven. Little is known about the impact of cultivar response to organic production systems on nutritive/phytochemical value of fresh or processed fruit. Enterprise budgets are needed to determine whether best organic blackberry production systems are economically sustainable.

What has been done
Collected a fourth year of data on the impact of weed management and cultivar on plant growth and production in organic blackberry, machine-harvested for processing.Two processing cultivars and two fresh market cultivars were studied at a grower collaborator site. There was little impact of fertilizer source on yield or fruit quality over the two-year study.Sensory analysis on flavor intensity of six different descriptors by an experienced panel was performed on 'Black Diamond' berries harvested during the 2013 season. The effect of three different weed management strategies, non-weeding, hand weeding, and weed mat, were examined.

Results
Total cumulative costs, including materials and installation (weed mat) over the 5 years were $3,302/ha for weed mat, $3,231/ha for hand-weeded, and $370/ha for non-weeded. Despite the relatively low cost of the non-weededmanagement strategy, low yield significantly reduced the net returns (gross fruit sales - weed management costs) of this production system. The hand-weeded and weed mat management strategies increased net returns by 40% and 71% compared to non-weeded, respectively. Weed mat had a cumulative net return 22% greater than that of the hand-weeded.There was little impact of fertilizer source on yield or fruit quality over the two-year study.Turning off irrigation after harvest had no effect on yield in either cultivar but reduced water use by 67,000 gallons/acre.Weed management showed a marked effect on flavor intensity. The intensity of sensory attributes for 'Black Diamond' appear to possibly be inversely related to phenolic and anthocyanin content, with the weed mat management strategy resulting in the highest values for virtually all sensory attributes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)
206	Basic Plant Biology
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #11

1. Outcome Measures

Improved information about biology, control and resistance of viral, bacterial, fungal diseases, especially disease reproduction, transport and spread; postharvest decay; models to predict risk; and relationships between disease susceptibility and disease resistance

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
WE continued breeding of three market classes of winter wheat, soft white, hard white and hard red winter wheat. The team identified four hard white breeding lines with commercial grade quality for potential release in 2015 and 2016. These classes were also evaluated for fire blight resistance.

What has been done
The first hard red winter wheat breeding lines were advanced into elite nursery evaluation and we Initiated transfer of resistance to BYDV and sbWMV into soft white winter, hard white winter and hard red winter wheat backgrounds. Initiated graduate research project on using an over-expressing glutenin allele to produce good bread quality hard winter wheat with sub-optimum

grain protein

Results
Research on a recombinant inbred line population identified QTLs associated with stripe rust and Cephalosporium stripe resistance and identified an epistatic OTL that modified expression of stripe rust resistance genes in some genetic background. We are conducting experiments to evaluate if progeny of Cotoneaster resulting from susceptible x resistant crosses exhibit fire bight resistance. These same progeny are triploids and will be evaluated for fertility.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems
502	New and Improved Food Products

Outcome #12

1. Outcome Measures

Produce the next generation of growers and agricultural eduactors by integrating agricultural education into high school curriculums and community education

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Motivated students are needed to replenish the rapidly aging agricultural demographics as well as to position American agriculture as a sustainable, worldwide leader. Research related to student

engagement has the potential to increase the success and retention of agriculture students, resulting in a larger, more diverse and educated workforce. Very little research
exists that examines the motivational and engagement variables in the context of agriculture. The purpose of this research project is to carefully examine the influences on college student motivation and identify ways to improve or impact student motivation and engagement.

What has been done
The program goals, broadly defined, are to: (1) Identify needs areas in relation to the motivation and engagement of college of
agriculture students, and (2) Develop strategies to improve student motivation and engagement in college of agriculture
students. The Program Objectives for the upcoming project period are to: 1) Identify the current levels of motivation in
selected college of agriculture students; 2) Analyze student motivation (self-efficacy, task value and autonomy) in relation to
learner-centered teaching approaches; 3) Develop programs and coursework which have the ability to impact and improve
student motivation and engagement; AND 4) Identify exemplary methodologies for increasing student engagement through
qualitative and quantitative assessment of teachers.

Results
Specific to goal 1, a national assessement of faculty involved in agricultural leadership education was conducted to determine the size and scope of agricultural leadership education. The results have been accepted for publication in the Journal of Leadership Studies and will be published in 2014. Specific to goal 2, a research study regarding undergraduate student motivation was conducted and the results published in the journal of the North American Colleges and Teachers of Agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
903	Communication, Education, and Information Delivery

Outcome #13

1. Outcome Measures

Number whose consumer business knowledge leads to improved opportunities, and more successful starts, activity, survival, and profitability in food enterprises, as well as new and improved value-added products

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Consumer tests are utilized by medium and large food companies to evaluate new products or test new product formulations on potential buyers. The typical objective is to examine various sensory attributes for liking and to examine whether adjustable product attributes such as saltiness, sweetness and texture are "Just About Right" or need reformulation, but packaging, message, and purchase intent questions can be incorporated or emphasized to evaluate the market. These pieces of information may help a company market its product to retailers or distributors by proof of liking or willingness to purchase. However, though this information is perhaps needed even more by those interested in starting-up a food company. A consumer test could help avoid serious losses in launching a product that consumers either don't like sufficiently or which will require a price which consumers aren't willing to pay. A consumer test can also help discover if small adjustments in formulation are needed. Properly executed such a study can also provide evidence to start marketing to retailers or look for financing. Unfortunately the costs of a professionally executed test can be prohibitive.

What has been done
A self-executed consumer test protocol for food entrepreneurs has been designed and is undergoing testing in Portland, Oregon. The key elements of the protocol are a template and instructions for development and execution of a survey, and a spreadsheet which automatically produces useful tables and charts from the survey data. The protocol was developed to allow entrepreneurs to evaluate their product and its market potential on a small, local scale.

Results
The survey protocol has been beta-tested at a craft market and three farmers markets with four different products. These beta testers all have recently started their small, local business with limited funds. Three have sold their products in farmers markets and at a small number of local retailers. One was still in product formulation stage. Further beta tests are expected to take place at a grocery store and at a restaurant. The protocol is expected to completed and available at the end of 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area

501	New and Improved Food Processing Technologies
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #14

1. Outcome Measures

Improved animal health

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Weaned beef calf performance is believed to be influenced by the availability of selenium.Our goal was to test whether feeding Se-fertilized forage increases WB-Se concentrations and performance in weaned beef calves. A second goal was to test whether beef calves fed Se-enriched alfalfa hay during the transition period between weaning and movement to a feedlot also have improved immune responses and slaughter weights.

What has been done
Recently weaned beef calves (n = 60) were blocked by body weight, randomly assigned to 4 groups, and fed an alfalfa hay based diet for 7 wk, which was harvested from fields fertilized with sodium-selenate at a rate of 0, 22.5, 45.0, or 89.9 g Se/ha.Blood samples were collected weekly and analyzed for WB-Se concentrations. Body weight and health status of calves were monitored during the 7-wk feeding trial. Increasing application rates of Se fertilizer resulted in increased alfalfa hay Se content for that cutting of alfalfa (0.07, 0.95, 1.55, 3.26 mg Se/kg dry matter for Se application rates of 0, 22.5, 45.0, or 89.9 g Se/ha, respectively).

Results

Feeding Se-fertilized alfalfa hay during the 7-wk preconditioning period increased WB-Se concentrations (PLinear < 0.001) and body weights (PLinear = 0.002) depending upon the Se-application rate. Based upon our results we suggest that soil-Se fertilization is a potential management tool to improve Se-status and performance in weaned calves in areas with low soil-Se concentrations.Calves fed the highest versus the lowest level of Se-enriched alfalfa hay had higher antibody titers (P = 0.02), thioredoxin reductase-2 mRNA levels (P = 0.07), and a greater neutrophil total antioxidant potential (P = 0.10), whereas mRNA levels of interleukin-8 receptor (P = 0.02), L-selectin (P = 0.07), and thioredoxin reductase-1 (P = 0.07) were lower. In the feedlot, calves previously fed the highest-Se forage had lower mortality (P = 0.04) and greater slaughter weights (P = 0.02). Our results suggest that in areas with low-forage Se concentrations, feeding beef calves Se-enriched alfalfa hay during the weaning transition period improves vaccination responses and subsequent growth and survival in the feedlot.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
311	Animal Diseases
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- 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.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

High throughput technologies for genotyping organisms such as plants and their pests and pathogens have dramatically accelerated in their power over the last two decades. This has

been especially true for DNA sequencing and DNA-based genotyping methodologies. The cost of sequencing has dropped 10,000-fold over the last ten years as second generation and third generation technologies have been introduced and have matured. The rapidly decreasing cost of sequencing is increasing the feasibility of whole genome sequencing and genotyping-by-sequencing (GBS). For example OSU participants in this project have used these tools for sequencing the Fragaria (Shulaev et al., 2011) and Brachypodium (Fox et al., 2013) genomes and detecting SNPs via restriction fragment amplification digests (RADs) in barley (Chutimanitsakun et al., 2011). In species with smaller genomes, larger numbers of individuals can now be genotyped by whole genome sequencing, providing access to millions of SNPs. For larger genomes and population sizes, reduced complexity sequencing can be used. These approaches are being used by OSU participants in two NIFA CAP projects (RosBREED and Triticeae CAP). A fourth generation of emerging sequencing technologies has the potential to drive costs down another 10-100-fold over the next five years.

Advances in genetic technology facilitate identification of genes determining the complex traits that will be targeted by breeding programs and allied research groups in addressing the challenges identified by this project. Candidate genes can be identified via genome wide association scanning (GWAS) and map-based cloning with reference to whole genome sequences. OSU researchers, for example, have identified candidate genes for low temperature tolerance QTLs in barley (vonZitzewitz et al., 2011) and eastern filbert blight resistance in hazelnut (Mehlenbacher et al., 2011). When coupled with the ever-expanding toolkit of analysis procedures, genomics resources allow for deeper mining of the phenotype data sets routinely generated by plant breeding programs and for the exploitation of high throughput phenotyping systems. As a consequence, molecular breeding strategies - such as marker-assisted selection (MAS) and genomic selection (GS) - are currently feasible in a range of economically important plants and are being used by OSU participants in this project. The OSU Center for Genome Research and Biocomputing (CGRB) plays a central enabling role in providing access to technology and analysis. For example, the CGRB is currently implementing a GBS pipeline that will play a central role in multiple GS projects.

Key Items of Evaluation

In the coming years, agricultural research, extension and education will need to address the "constraints of a growing population, pressure on natural resources, and the challenges of climate variability and change...to increase agricultural and natural resource sustainability" as pointed out in the Agriculture and Food Research Institute (AFRI) Fiscal Year 13 Request for Applications in Food Security. There are many issues to address and resolve, including the uncertainties on the magnitude of climate change, the effects of technological changes on productivity, global food demands, and the numerous possibilities of new crops and new production areas for existing crops. Climate change is expected to lead to a net warming of the planet and increased volatility in temperature, moisture, and weather events. These factors will exacerbate the demands of food systems due to decreases in potential yields likely caused by shortening of the growing period, an overall decrease in water availability and changes in temperature-dependent physiological processes. Other challenges for agricultural research to address include:

- Achieving greater efficiencies in terms of water and nutrient usage
- Improving durable resistance to new pathogens and new strains of existing pathogens

- Improving resistance to abiotic stresses, including temperature, moisture, and salinity
- Developing maximum flexibility in cropping systems in response to changing patterns of land use and availability

The diversity of crops, environments and microclimates of Oregon and the Pacific Northwest afford our faculty and the Experiment Station the opportunity to investigate the challenges of crops important to both in Oregon and the world. Climate change is expected to provide additional diversity. Even in this increasingly complex scenario, there are unifying themes across the state, from the high rainfall valleys of the west to the deserts of the east. This "state-as-laboratory" provides an excellent model for integrating research targeting complex stresses. For example, on the west side more than 70 specialty crops have an annual farm-gate value of about $3 billion. Much of the east side winter wheat crop is dependent on stored soil moisture. Both cropping systems share challenges in terms of such fundamental processes as germination, growth and development, and seed biology. In turn, each of these biological phenomena can be addressed using fundamental research and breeding tools enabled by the CGRB.