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			5%	
111	Conservation and Efficient Use of Water			5%	
121	Management of Range Resources			5%	
202	Plant Genetic Resources			5%	
204	Plant Product Quality and Utility (Preharvest)			5%	
205	Plant Management Systems			10%	
206	Basic Plant Biology			5%	
216	Integrated Pest Management Systems			5%	
301	Reproductive Performance of Animals			5%	
302	Nutrient Utilization in Animals			5%	
307	Animal Management Systems			5%	
501	New and Improved Food Processing Technologies			5%	
502	New and Improved Food Products			5%	
511	New and Improved Non-Food Products and Processes			5%	
601	Economics of Agricultural Production and Farm Management			5%	
602	Business Management, Finance, and Taxation			5%	
603	Market Economics			5%	
607	Consumer Economics			5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	35.0	0.0
Actual Paid Professional	0.0	0.0	143.0	0.0
Actual Volunteer	0.0	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**
0	0	1733253	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	10577051	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	13123297	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 this program will develop improved practices for cropping and animal production systems that 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. Animal systems will reduce wastes and discharges while improving productivity and husbandry techniques.

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, with a special emphasis on rural markets in America; (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.

- 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, extension faculty, 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, Extension personnel and other educators
- Genetic companies
- Nutritional consultants
- Nonprofit conservation groups and ecologists
- General public and consumers

3. How was eXtension used?

eXtension was used to disseminate small fruit as well as integrated pest management information.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012

Actual: 4

Patents listed
Method To Trigger RNA Interference
PI - Carrington, James C. / Allen, Edward

Metabolic Control of Seed Germination
PI - Nonogaki, Hiroyuki / Beachy, Roger

PBR Potato 'AmaRosa'
PI - Yilma, Solomon

PVP Potato, "Sage Russet"
PI - Vales, M. Isabel

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	4	150	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- BASIC PHYSIOLOGY OF PLANTS AND ANIMALS...1- Environmental response by plants

Year	Actual
2012	0

Output #2

Output Measure

- BASIC PHYSIOLOGY OF PLANTS AND ANIMALS ...2 - Animal reproductive factors

Year	Actual
2012	0

Output #3

Output Measure

- DECIPHER GENOMES, GENETICS AND MECHANISMS...1- Niches and functions served by Bacteria And Viruses And Other Microorganisms

Year	Actual

2012	0

Output #4

Output Measure

- DECIPHER GENOMES, GENETICS AND MECHANISMS...2 - Genetic diversity, pathways and function

Year	Actual
2012	0

Output #5

Output Measure

- DECIPHER GENOMES, GENETICS AND MECHANISMS...3 - Genes and Mechanisms in disease resistance and tolerances

Year	Actual
2012	0

Output #6

Output Measure

- DECIPHER GENOMES, GENETICS AND MECHANISMS...4 - Reproductive factors in plants and animals

Year	Actual
2012	0

Output #7

Output Measure

- BREEDING PROGRAMS THAT RESULT IN DESIRABLE TRAITS, CULTIVARS AND VARIETIES...Indicator - improved traits, germplasm, and varieties. o Improved germplasm, breeding lines and varieties for barley, meadowfoam, potato, wheat, vegetables, fruits, tree nuts, and ornamentals o Improved traits (e.g., lipids, starches and proteins), as well as overall crop quality

Year	Actual
2012	0

Output #8

Output Measure

- IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...1 - improved animal reproductive success rates o Developed improved, surviving offspring and appropriate delivery dates, o Reduced production inputs and improve weaned offspring weight

Year	Actual

2012	0

Output #9

Output Measure

- IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...2 - animal nutrition, feeding and forage relationships. o Evaluate grazing distribution and use of riparian pastures, mixed conifer rangelands o Identify influence of stocking rates, season, and woodland overstory on grazing

Year	Actual
2012	0

Output #10

Output Measure

- IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...3 - inputs for plant systems in dryland and irrigated production and on small farms * Improved best management practice recommendations for crops, including inputs (e.g., nutrients, temperature, moisture), abiotic stresses, plant growth regulators, attack by other organisms, and environmental mitigation (e.g, leaching water and nitrate to groundwater). * Efficient irrigations systems, e.g., subsurface drip irrigation, and schedules * Improved production efficiency through precision management systems * Potential alternative crops and best management practices for them * Improved practices in small farms.

Year	Actual
2012	0

Output #11

Output Measure

- PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS...1 - pest management systems and strategies * Weed management through improved herbicides and cultural management, including optimum inputs and agronomically compatible weed management * Efficacy of diverse, multiple control treatment programs * Fumigants used at reduced rates in combination with other nematicides * Decay risk prediction models and management programs appropriate for producers * Develop basic knowledge of pests by conducting pest biology trials at lab, growth chamber, greenhouse, small plot and/or field scale levels; control of slugs, symphilids, crane flies, cereal leaf beetle; native and invasive grassy and broadleaf weeds including wild oat, brome spp., jointed goatgrass, annual bluegrass, and clover broomrape, Sudden oak death, orchardgrass, choke pathogens, cereal leaf beetle * Understand species complex and fungicide sensitivity * Technologies for efficient application of viral vectors in plants.

Year	Actual
2012	0

Output #12

Output Measure

- PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS...2 - disease resistance * Uncover disease resistance gene evolution in plants and compare evolutionary histories * Develop and release cultivars with improved capacity to resist or tolerate infections by plant-pathogenic fungi and plant-parasitic nematodes * Innovations that mitigate the detrimental effect of diseases, such as Verticillium wilt, probably the most limiting disease of potato in the Treasure Valley * Understand physiological basis of plant disease resistance and susceptibility

Year	Actual
2012	0

Output #13

Output Measure

- PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS...3 - herbicide identification and resistance * Identify herbicides that can be safely and efficaciously used in different crops * Release new crop varieties with herbicide resistance. * Control downy brome and other weeds through extracts from broadleaf plants (natural herbicides) * Evaluate new herbicide candidates and non-chemical cultural practices under field conditions for weed control effectiveness, crop safety, and soil persistence

Year	Actual
2012	0

Output #14

Output Measure

- ENVIRONMENTAL HEALTH AND ECOLOGY...1 - erosion control o Conduct large plot studies in commercial wheat fields to develop season-long chemical fallow management systems and compare chemical fallow treatments with conventional tilled summer.

Year	Actual
2012	0

Output #15

Output Measure

- ENVIRONMENTAL HEALTH AND ECOLOGY...2 - animal effects o Analyze competition between deer, elk, and cattle in grazing impacts o Develop more economical and environmentally sustainable dairy and beef production systems that meet new environmental requirements

Year	Actual
2012	0

Output #16

Output Measure

- ENVIRONMENTAL HEALTH AND ECOLOGY...3 - green management practices o Develop green or organic practices for industry, such as plants adapted to specific sites and specific environmental purposes, ecological orchard systems, organic cover crops o Model the spread of an invasive species making use of genomics (microarray, sequencing) and ecological (field/greenhouse experiments) data.

Year	Actual
2012	0

Output #17

Output Measure

- ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...1 - land use management analyses. o Assess land ownership fragmentation and economic impacts o Develop ranch economic models o Develop framework to integrate economic, social, and ecological aspects of rangeland sustainability o Evaluate use of rangeland website o Identify policy alternatives for fire and fire surrogate management

Year	Actual
2012	0

Output #18

Output Measure

- ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...2 - profitability and productivity studies o study productivity factors to measure technological strength of U.S. agriculture and processed food industries o Study community based micro processing centers for agricultural products

Year	Actual
2012	0

Output #19

Output Measure

- VOLUNTEER PROGRAMS o Reach Master Gardners (new, past, and current) through MG training programs and materials, websites, and other distance education programs o Refine OSU Urban and Community Horticulture Website to reach new audiences.

Year	Actual
2012	0

Output #20

Output Measure

- DISTANCE and OTHER EDUCATION OUTLETS o Develop new databases and frequently most asked questions for eXtension o Compare perceptions of science teachers and agriculture teachers on integrating science into the agriculture curriculum

Year	Actual
2012	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	1a. Improved plant production management systems, including precision systems, cultural practices, conservation strategies, innovations, pest control, and organic systems
2	2a - improved animal reproductive biology and management for better fertility and reduced uterine infectionsin dairy and beef cattle and sheep; as well as better understanding of reproductive genetics and developmental biology
3	3 - expanded forage and nutrient management knowledge to understand how management practices can synchronize the relationship between forage nutrient supply and cow nutrient requirements, and how feedstuffs can influence the health and physiological stress of the calf.
4	4a - plant breeding for improved or novel plant attributes and for human health benefits, e.g., antioxidants
5	5a - 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
6	6a - economic studies help Producer groups learn about factors shaping global markets and productivity-convergence effects on US agricultural and processed food production and trade
7	A4 - Creation and adoption of new varietals will reduce yield losses and expenses, rejuvenate orchards, achieve better productivity and efficiency, provide environmental benefits (less fungicide applications, etc.), allow effective competitiveness on the world market o Commercial processors and fresh market growers, as well as home gardeners, achieve greater production efficiency, more stable productivity, and reduced costs from the use of improved varieties.
8	A2 - Improved animal fertility and genetic stock, for example: o Producers and animal health professionals improve fertility and prevent uterine infections in dairy cattle from implementing every-day on-farm practices. o Industry stores sperm cells with minimal loss of function for use as a commodity and for long-term maintenance of genetic stock
9	A3 - Animal producers improve their economic competitive advantage and improve the ecological sustainability of production system
10	A1b - conservation strategies adopted o Conservation bio-control strategies are implemented differently and active restoration strategies occur. Land owners and managers assess ecosystem services provided by their riparian restorations via a user-friendly web tool. o Growers adopt improved, scale-dependent practices selected for various market niches with emphasis on reducing environmental degradation and impact. Commercial small farms will have more diverse and economically viable technologies and production techniques or systems available for their use o Growers implement drip irrigation and produce more marketable yields of onions, potatoes, and poplar trees than with furrow or sprinkler irrigation.and achieve efficient use of soil nitrate and the other available N sources under drip irrigation. o Generation of the viral vectors for grapevine disease control and functional genomics vectors have a potential for replacing current strategies of using chemical fungicides and bactericides with viral biocontrol strategies.
11	A6a - improved agricultural economies o The knowledge generated about productivity-convergence will be crucial in designing policies to improve the welfare of agricultural producers and food processors and the general public who will be affected by the evolution

	of these industries (e.g., food quality and safety, resource scarcity and pollution). o Domestic policymaking and multilateral trade negotiations will mitigate effects of climate change in reduction of trade barriers and subsidies. o Climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. This information will be important in the context of domestic policymaking and multilateral trade negotiations as it pertains to reduction of trade barriers and subsidies.
12	Change Indicator 1 - Ecological / Environmental o Landscapes will impact the way Oregonians use and manage plants to create beauty, modify environment, and improve health and well-being of individuals and communities. This program will change the way people use plants to modify their environment such as moderating temperature on buildings, improving water infiltration on surfaces, contributing to ecosystem services at landscape or watershed scales, etc. o Food/farm systems reduce surface and/or groundwater or other pollution in the environment, while improving nutrient and water budgets, and organic production systems. o New reduced risk, environmentally safer pest control tools will be available that are target pest specific will facilitate the implementation of IPM programs. o Environmental change will occur from temperature modifications; enhanced water conservation and wildlife; reduced runoff, fire incidence and pests; improved nutrient use and recycling; and other ecosystem services. o Better ecological methodologies will lead to more social, economic, and environmental benefits and cost effective and sustainable restoration. Improved valuation of ecological services associated with restorations will greatly facilitate market-based conservation practices such as mitigation banking and effluent trading. Better conservation bio-control strategies will decrease the costs associated with insect losses and the use of insecticides. o enhance the nation's natural resource base and environment by revealing cost-effective means to control plant diseases and reduce the need for pesticides. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Improved soil, water, and crop management practices and strategies that protect Oregon resources o Management of public and private rangelands will sustain and improve ecological values as desired by the public and the rural communities that depend on the natural resources. o Strategies for avoiding invasive pests will be in place o Plant disease resistance will lower the amount of pesticide use, resulting in a more healthful environment and reduced exposure of humans to hazardous chemicals.
13	Change Indicator 2 - Societal o Social change will occur through new perceptions of green technologies and social value or capital of horticultural landscapes to enhance human health, therapy, wellness, and social networks. o Social impacts include consumer awareness and appreciation of the abundance of locally grown ornamental plant materials and native species for use in landscapes will increase; also awareness of invasive species. o Social change will enhance quality of life in rural areas by improving economic stability of family farms, wineries, wine tasting, and tourism with new practices and cropping systems and/or livestock management practices/systems. o Social change will improve economic stability of families and quality of life with improved cropping systems. o Worker safety with bio-based pest control and dwarf rootstocks (short ladders) will be improved; farm workers will find other employment with increased mechanization. Local and community markets increase social networking in rural communities. o Increased opportunities for rural community marketers and processors will be developed; o Public health will be improved through the use of crops with improved nutritional value o Sustainable and economically viable wheat and dryland cropping industry for vibrant rural economy in eastern Oregon o The public has access to an ongoing research data base that allows for natural resource/land management decisions to have a fundamental basis in science.

14	Change Indicator 3 - Economic o The economic value of landscapes will increase. Cost and benefit analyses of plants usage to modify environments with green technologies will reveal positive economic impacts and improved health and wellness from horticultural therapy. o Economic impacts include reduced costs, increased benefits, and production efficiencies from use of water and nutrient budgets in recycled water systems, improved pest management, and diagnosis of plant problems to increase sales of quality products. Costs of regulatory procedures will be reduced with water and nutrient budgets and management systems. o Profitability of berry crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Machine harvest technologies will be adapted or developed for Oregon to reduce production costs and improve competitiveness in global markets. o Profitability of vegetable and specialized seed crops is expected to improve as new cropping systems, cover crops, nitrogen management, reduced tillage, and cultivars are adopted by growers. Communication networks will enable timely communication and utilization of technologies to alert growers of weather related pest incidence, educational events, and practices. o Profitability of viticulture in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Niche markets, wine tasting, and tourism are primary outlets for Oregon wines. o Profitability of tree fruits and nut crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. High density orchards are expected to improve production efficiencies and increase markets. o Agricultural producers will realize greater economic return in their cropping enterprises; Plant nutrient and other production input use will be optimized o Producers maximize the control of postharvest decay within the various production and marketing objectives of producers. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Higher-value niche markets will be established o Beef producers in the Intermountain and Great Basin areas remain completive on a regional, national, and global basis. o Producers greatly improve their reproductive efficiency by removing bad genes thus increasing productivity and economics of the industry. Industry thus has improved resource and economic sustainability through reduced costs and/or increased productivity. o Better understanding of the costs, benefits, and potential impact of legislation on the dairy industry, and thus more economically and environmentally sustainable systems for dairy and beef production. o Intense selection reduces needs for assistance in pasture lambing conditions. o Economic viability of farmers markets will be enhanced o Agricultural producers will realize greater economic return in their enterprises; o Increased potato yield will increase potato farmers' income as well as the stability of potato production of the world. The potential increase from 29,000 acres to as much as 100,000 acres will increase Oregon's market share and economic benefits.
15	1b - sustainable gardening practices (eg. fertilizers, water, and pest management including organic), horticulture and aboriculture principles and practicea
16	1c - dryland production management systems use agronomic practices for commercially promising alternative crops under reduced tillage. * Producers, NRCS, conservation districts and environmental agencies learn about whole farm nutrient management. * Basic agronomic practices for commercially promising alternative crops under reduced tillage systems.
17	1d - irrigated production management systems use drip and micro sprinkler irrigation systems to produce increased crop yield and crop quality with less water and nitrogen than with furrow and regular sprinkler irrigation
18	6b - Improved knowledge of consumer and market conditions and factors that affect business survival and competitiveness - Improved understanding of market conditions and knowledge to determine business choices. - Development of a process map for food business

	development and planning. - Training of nascent and existing food entrepreneurs in food business management. - Expanded knowledge base of factors important to distinguish different types of consumers and their food choices - Develop an understanding of motivations for food choice and strategies to impact them - Improved marketing approaches for local markets and community food systems
19	4b - identify genes involved in critical plant processes to improve plant qualities
20	5b - 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
21	5c - Elucidation of the underlying molecular mechanisms of pathogenicity (virulence), disease susceptibility (compatibility) and disease development, gene evolution, and engineered gene expression vectors
22	7 - integrate agricultural education into high school curriculums and community education
23	A1a - plant management tools are used by private and public sector, for example: * Farmers will more strategically plan for crop production * Crop rotation sequences and green manure crops in combination with reduced or no nematicide use, particularly for short season potato crops to suppress nematode populations.
24	A5 - pest and pathogen management tools are used by growers, for example: * End users adopt new pesticide and pest management systems and strategies for working with invasive pests * District-specific control programs will reduce usage of fungicides with low efficacy and emphasize integrated control practices. * Growers, packers and extension faculty incorporate practices to lower decay risk, including reduced fungicide usage, and identify high risk fruit lots and to market these before decay has time to develop in storage. * Interaction of program components and the overall efficacy of various combinations of orchard, postharvest, and storage factors will be the guides to the description of programs for implementation in the pear industry. * Determine packinghouse water system contamination by fungal pathogens. Commercial service lab can apply PCR technology to maintain sanitation determine most effective fungicides for each species. * Customized decay control program for each unique pathogen complex.
25	A7 - agricultural education produces the next generation of growers and eduactors
26	A6b - consumer business knowledge leads to improved opportunities, survival, and profitability in food enterprises, as well as new and improved value-added products - New and existing businesses expand markets based on new understanding about market factors - Increased business activity and success in the Northwest food industries. - More successful starts by food businesses
27	1e - Protection of natural environment from agricultural chemicals, for example: - Reduce the fate of agricultural chemicals in remote aquatic ecosystems - Improve policies or regulation of pesticides

Outcome #1

1. Outcome Measures

1a. Improved plant production management systems, including precision systems, cultural practices, conservation strategies, innovations, pest control, and organic systems

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increasing efficiency and decreasing inputs (labor and chemical inputs) in vineyard management is an important goal for Oregon wine grape producers. They have the highest production costs per acre in the nation due to small production size and high-tier quality production market. Both factors lead to primarily manual labor practices being used. It is critical for growers to have a sustainable and efficient vineyard system while also keeping their production goals in mind. The reduction in chemical inputs (fertilizers, pesticides, and fuel) is both economically and environmentally beneficial. The Oregon wine grape industry seeks ways to decrease production cost while maintaining high quality fruit standards.

What has been done
Interdisciplinary research and outreach were conducted to address several identified needs. These included a) use of vineyard floor management practices to control vine vigor and increase fruit quality; b) sustainable management of young vineyards using cover crop mulching; c) modifying canopy management practices to increase disease control and fruit quality; and d) defining in-field metrics of vine balance and fruit quality. We also developed online outreach methods for the Oregon wine grape industry, i.e., publications, newsletters, seminars, a 10-week Viticulture and other courses, YouTube educational videos, web articles, and eXtension tools.

Results
Among the findings, we estimate that the least expensive vineyard floor management regime (growing grass in the alleyways) produce savings of $372 per acre in reduced tillage, herbicide use, reduced hedging, leaf pulling, and shoot thinning. Because 60% of the industry uses grass between the alleyways of their vine rows and also experience high vigor, the estimated savings are $4.6 million/year across the entire Oregon industry if they implement this practice. Further, leaf removal early in the season, before bloom or at bloom, resulted in less disease infestation at harvest, berries with higher color and quality compounds that are important to wine quality.

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

Outcome #2

1. Outcome Measures

2a - improved animal reproductive biology and management for better fertility and reduced uterine infectionsin dairy and beef cattle and sheep; as well as better understanding of reproductive genetics and developmental biology

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
By improving the reproductive performance of animals, Oregon State University researchers ultimately hope to provide food products at reduced cost, thereby improving global access to food.

What has been done
Our researchers also investigated tools to help the poultry industry become more efficient in breeding and maintaining populations. OSU research has shown that semen quality can now be defined by a single gene-based quantitative term, measured by mobile sperm produced per rooster per day, as opposed to a list of attributes, which were previously relied upon, such as volume, sperm concentration or sperm motility.

Results
This tool can help the poultry industry become more efficient in breeding and maintaining populations. H-Line International has implemented the use of the commercial sperm mobility assay as an integral part of their selection program for the past ten years. OSU researchers also suggest that genotyping may be able predict the reproductive potential of male chickens using DNA recovered from chicks at hatch.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

3 - expanded forage and nutrient management knowledge to understand how management practices can synchronize the relationship between forage nutrient supply and cow nutrient requirements, and how feedstuffs can influence the health and physiological stress of the calf.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Animal production is a major contributor to the U.S. economy, but increasing costs of production, the decline of real prices towards a world market price, and environmental issues may jeopardize the long-term sustainability of these farms. Currently, we?re trying to find out if a cow?s ability to put on weight is related to whether its paternal ancestors were raised on grass or grain. Some say that U.S. bulls are raised on grain, their offspring, which typically are raised on forage, don?t put on weight efficiently because their genetics aren?t geared for forage. We?re also looking at how genetics influence the marbled fat that gives meat its flavor.

What has been done

For the past two years we bred cows to a New Zealand bull that was raised on forage and comes from a line of grass-fed bulls. We will compare results to those obtained for cows bred to a U.S. bull raised on grain and from a line of grain-raised sires. We?ll breed their female offspring to different grain-raised bulls for the next 12 or so years. In 2005 and 2006 we bred some cows to a bull that throws calves with high marbling and we bred other cows to a bull that instead produces calves that weigh more. Over the course of about a dozen years, we shall monitor results.

Results
We will obtain evidence of how expensive the female breeding stock is to maintain by evaluating which lineage requires more feed to put on weight. We will continue breeding and we?ll see which offspring have the most marbling and put on the most weight. We will see how this approach affect costs, because cattle that put on more marbling tend to be more expensive to feed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

4a - plant breeding for improved or novel plant attributes and for human health benefits, e.g., antioxidants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fruits and vegetables with anthocyanins, an antioxidant, are desirable for healthy diets. Anthocyanins have been shown to help with cognitive function, and help reduce inflammation and oxidative stress.

What has been done

Jim Myers, a researcher from Oregon State University officially rolled out a new breed of tomato in 2012. The Indigo Rose tomato is being billed as the first to contain anthocyanins and is intended to be grown in home gardens and sold in supermarkets. Anthocyanins gives blueberries and the Indigo Rose tomato their blueish-purple hue. And while blueberries have higher concentrations of anthocyanins, researchers point out that tomatoes are eaten almost daily in the US and are the fourth most popular fresh-market vegetable behind potatoes, lettuce and onions.

Results
Indigo Rose is a full-season cultivar in Oregon with an average first ripe date about 91 days after transplanting, which is about 13 days later than Siletz and eight days later than Early Girl. Its fruit yield is similar to the heirloom cultivar Black Prince. As the Indigo Rose is self-pollinating, seeds saved will grow true and not produce hybrids. Genetic engineering techniques were never used to develop these lines. Myers highlights that many wild tomato species have anthocyanins in their fruit, and until now most home gardens have only had the beneficial pigment in inedible leaves and stems. The novelty variety is intended for home gardens and the fresh market, and is now available in seed catalogues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
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
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #5

1. Outcome Measures

5a - 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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Red clover, a perennial crop, is raised for seed production in Oregon but by the end of the second year the crop stand is very poor due to infestation by a bark beetle pest, the clover crown borer. Root feeding by adults and larvae causes early plant death, and leads to secondary pathogen infections. Clover crown borer is the sole reason inhibiting red clover growth beyond 2 years. The reduced life cycle of this perennial crop creates enormous economic hardship as growers have to remove the crop and prepare the field for a different crop. Organochlorine insectides related to DDT provided control but these insecticides are now banned. Currently, no control options exist for clover crown borer.

What has been done
The clover crown borer was examined in commercial red clover fields in western Oregon for weak links that can be targeted for pest management options, such as biology, newer insecticides currently registered for red clover or entomopathogenic nematodes. Adult emergence was monitored, and every week plants were dissected to determine stages of pest development. Abundance of the pest in fields of four different ages (fall planted, spring planted, one harvest complete, two harvests complete) was estimated. Insecticides (Brigade, Sevin, Lorsban, Seduce, Wrangler, Swagger, War Hawk, Platinum and Coragen) were applied in fall and spring. Each of four nematode species was evaluated at 25 and 75 infective juveniles /cm2.

Results
Yellow sticky cards were suitable for monitoring adults as they emerge from the ground, (late April through July) and Berlese funnels perform well for monitoring abundance (but not for larvae which remain within the roots). Borer eggs are present from early May through the end of July; larvae develop from mid-May through August, and pupal development begins late July. Fall planted fields do not have any borers the following year, while spring planted fields can have high numbers - the difference is likely due to difference in size of the roots - fall planted fields roots are likely too small for development of the larvae and hence adults avoid infesting these plants. Highest numbers of borers are present in fields that have completed two harvests. None of the insecticides currently registered for red clover seed production provide control of the pest irrespective of timing of insecticide application. Based on laboratory studies, the nematodes Heterohabditis marelatus, Steinernema carpocapsae, and Steinernema kraussei have potential for killing clover crown borer adults at the higher dose of 75 infective juveniles /cm2.

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 #6

1. Outcome Measures

6a - economic studies 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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many factors contribute to changing global trade patterns in agriculture and processed food industries, particularly related to technological change and trade costs. It is important to focus on measuring the impact of changes in trade costs, which refer to all factors limiting the movement of goods and services across countries (e.g. transportation costs, tariffs) on domestic production and exports, and employment in food industries.

What has been done
Having completed the measurement of trade costs by U.S. regions in agricultural and processed food industries, we proceeded to examine their impacts on business dynamics. That is, has the falling trade cost created more opportunities for U.S. businesses (more new firms, i.e. entry relative to business deaths or exits)? Also, how did continuing businesses alter production and employment when faced with declining trade costs? Empirical analysis showed that falling trade costs increases exit of domestic firms, presumably the low-productivity ones. However, net job creation of continuing firms in these industries remains unaffected by declining trade costs. Moreover, substantial regional variation is observed in the impact of falling trade costs on business dynamics.

Results
This research has contributed to improved understanding of factors limiting U.S. trade in agriculture and food at a regional level. For instance, bilateral trade costs between U.S. - China has significantly declined during the past decade especially for the west coast states relative to those on the east coast of the United States. Similarly, the Great Lakes region faces relatively lower bilateral trade costs with Canada, while Texas or Arizona have lower trade costs with Mexico. Such variations in trade costs among regions bring about interesting patterns of business dynamics: firm entry, exit and net job creation. Thus, regional economic development depends on alleviating high trade costs faced by several U.S. regions in accessing global

markets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
607	Consumer Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #7

1. Outcome Measures

A4 - Creation and adoption of new varietals will reduce yield losses and expenses, rejuvenate orchards, achieve better productivity and efficiency, provide environmental benefits (less fungicide applications, etc.), allow effective competitiveness on the world market o Commercial processors and fresh market growers, as well as home gardeners, achieve greater production efficiency, more stable productivity, and reduced costs from the use of improved varieties.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cereals are the staff of life and Oregon is a key producer of cereal crops. Over the past five years, Oregon has produced an estimated 10 million tons of wheat and barley with an estimated farm gate value of 2 billion dollars. To maintain and expand Oregon?s role in cereals production, continued progress in variety development and fundamental science is essential. New varieties must be efficient in input use (e.g. nitrogen and water) and resistant to a range of biotic stresses (e.g. diseases) and abiotic stresses (e.g. moisture and low temperature). Progress in variety development requires progress in fundamental research on the genetic basis of target traits. Grain quantity alone is not sufficient, continued progress is essential in terms of grain quality.

What has been done
The breeding program team has released 12 varieties and germplasms in the past five years. The program has produced 62 peer reviewed publications and book chapters and a wealth of other materials. The cereals programs have trained 16 graduate students and hosted six visiting scholars from Egypt. Spain, and Uruguay. The PIs have reached thousands of stakeholders via field days and hands-on events. Faculty heighten awareness of the nutritional importance of whole grain diets by participating in hands-on exercises with practitioners in venues ranging from the Kneading Conference West to the Wheat Marketing Center. Grant awards have expanded the ability of the faculty to produce new varieties.

Results
Knowledge advances include our understanding of the genetics of low temperature tolerance, durable resistance to a range of diseases, and cereal quality. The overall quality of Oregon soft white wheat has been improved through the release of superior quality varieties (e.g. Skiles, Ladd, and Kaseberg). The barley varieties Full Pint, Verdant, Alba, and Streaker represent new opportunities for growers to produce malt free of epiheterodendrin, high quality forage with less water input, higher yields of feed without fungicide, barley without hulls suitable for direct human consumption. Our wheat and barley developments led to significant changes in varieties planted, marketed, and used. Oregon wheat varieties were planted on 80% of the winter wheat acres in Oregon during the past five years with varieties such as ORCF 101 and ORCF 102 becoming the top varieties grown in 2011 in Oregon and Washington, respectively.

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
601	Economics of Agricultural Production and Farm Management

Outcome #8

1. Outcome Measures

A2 - Improved animal fertility and genetic stock, for example: o Producers and animal health professionals improve fertility and prevent uterine infections in dairy cattle from implementing every-day on-farm practices. o Industry stores sperm cells with minimal loss of function for use as a commodity and for long-term maintenance of genetic stock

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
By improving the reproductive performance of animals, Oregon State University researchers ultimately hope to provide food products at reduced cost, thereby improving global access to food.

What has been done
OSU investigators studied interactions between bovine immune and reproductive systems, looking for the best conditions for pregnancy and genes to better understand embryo development. Preventing bovine uterine infections by developing a new therapeutic regimen that avoids antibiotics was also another task. The results of this project's research will be published in scientific journals, included in material used for formal classroom and laboratory instruction and, most importantly, outreach with industry. Several students were trained through this project, resulting in several theses and a dissertation.

Results
Oregon State University researchers have improved the reproductive performance of animals, ultimately to provide food products at reduced cost and improve global access to food. A medicine known as Lutalyse yielded faster bovine pregnancies with fewer health treatments required. Per cow, avoided costs added up to a savings around $75, while the cost for a dose of Lutalyse is just $3. With two doses administered soon after the birth of a calf, a female cow's body is soon fighting any lingering uterine infections and fertility is improved.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #9

1. Outcome Measures

A3 - Animal producers improve their economic competitive advantage and improve the ecological sustainability of production system

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The year 2011 was a much needed good year for Oregon farmers and ranchers, who played an increasingly vital role in the Oregon economy. Cattle was again the top commodity in 2011, with sales rising 12.8 percent to $799.8 million, partly due to droughts in Kansas, New Mexico, Oklahoma and Texas which forced ranchers in those states to cut back their herds, but also with better range and herd management. Targeted research and extension continue to make a difference to Oregon producers.

What has been done
In 2012 Beef Industry Tour and In-Service Training were offered in several locations within Oregon and attracted more than 250 participants. Rangeland field days also continue to attract high participation and exchange of information among ranchers, conservation groups, governmental land managers, and research and extension faculty.

Results
Our research demonstrated that feeding polyunsaturated fatty acids around the time of artificial insemination has the potential to increase reproductive performance by increasing circulating progesterone. Acclimation of feeder steers to human handling after weaning improves cattle temperament but impairs performance during feedlot receiving. Poor feedlot receiving performance is typically detected in transported feeder cattle; we found that 24-h transport and 24-h feed and water restriction elicited acute-phase protein responses and are the major causes for the acute-phase reaction reduced performance of feeder cattle. Industry is trying to reduce the stress on the cattle so they produce better beef - stress can change the metabolic processes of the body. If the calves are stressed before they go to slaughter, their meat will look darker and drier and may be tougher. That is not good for the consumer or the animal. So we are seeing improvements in how animals are housed, handled, and transported to reduce as much stress as possible.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
302	Nutrient Utilization in Animals
307	Animal Management Systems
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #10

1. Outcome Measures

A1b - conservation strategies adopted o Conservation bio-control strategies are implemented differently and active restoration strategies occur. Land owners and managers assess ecosystem services provided by their riparian restorations via a user-friendly web tool. o Growers adopt improved, scale-dependent practices selected for various market niches with emphasis on reducing environmental degradation and impact. Commercial small farms will have more diverse and economically viable technologies and production techniques or systems available for their use o Growers implement drip irrigation and produce more marketable yields of onions, potatoes, and poplar trees than with furrow or sprinkler irrigation.and achieve efficient use of soil nitrate and the other available N sources under drip irrigation. o Generation of the viral vectors for grapevine disease control and functional genomics vectors have a potential for replacing current strategies of using chemical fungicides and bactericides with viral biocontrol strategies.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oregon has a diverse, economically important berry crop industry with about 23,000 acres harvested for a farm gate value of over $123 million in 2011. Berry crops are grown on over 1000 family farms in Oregon. Prices for organically grown blueberries were generally 20 to 100% higher than for conventionally produced fruit, attracting growers to this new production method. Research on organic production systems was needed to meet challenges associated with

growing this crop organically, to assist growers in developing best management systems, and to assess production costs and returns. Existing growers struggle to remain economically viable in this global market.

What has been done
We established a planting in Oct. 2006 to evaluate the effects of cultivar, bed type, weed management, and fertilizer source and rate. The site was certified organic in 2008 and data have been collected from 2006-2012 to date. Research has been disseminated to industry via presentations, field days, and the web.

Results
Organic production systems are thought to be better for the environment in that use of synthetic pesticides is prohibited. Thus, run off and leaching of synthetic pesticides and fertilizers to water sources simply does not occur under organic systems. We have developed organic production systems that have a similar yield and production systems cost to conventional systems. A cost of production study was published to assist growers in decision making. In our study to date, the lowest rate of fish fertilizer has had a greater yield than the higher rate of fertilizer. Minimizing fertilizer use or improving efficiency of application, is of benefit to the grower and to the environment. The use of weed mat mulch in new plantings in Oregon has increased from an estimated less than 10% of the acreage in 2006 to more than 80% of the new acreage in 2011. We believe that our positive findings have had a significant impact on this new production system in Oregon. The positive effects of using weed mat (landscape fabric) on plant growth and yield have reduced herbicide requirement by 3 applications/year; the use of weed mat in conventional plantings will lead to a broader impact (beyond organic plantings).

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
206	Basic Plant Biology
216	Integrated Pest Management Systems
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #11

1. Outcome Measures

A6a - improved agricultural economies o The knowledge generated about productivity-convergence will be crucial in designing policies to improve the welfare of agricultural producers and food processors and the general public who will be affected by the evolution of these industries (e.g., food quality and safety, resource scarcity and pollution). o Domestic policymaking and multilateral

trade negotiations will mitigate effects of climate change in reduction of trade barriers and subsidies. o Climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. This information will be important in the context of domestic policymaking and multilateral trade negotiations as it pertains to reduction of trade barriers and subsidies.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Effective research-project assessment typically is impeded by project variety. The principal difficulty is that research output is essentially information, with its tendency to be non-rival even if excludable, and slow to reveal itself. The commonly encountered bibliometric approaches to this problem, namely to regress research studies? publication or patent counts against such study features as total expenditure and topic area, is that they offer little information about the content of the scientific projects examined. A research output metric is needed that will allow attention to inter-project variety and to reveal the nature and characteristics of the research findings themselves.

What has been done
Based on Bayesian theory, we econometrically evaluated factors influencing the magnitude of scientific discovery, applying the method to a biological research program consisting of numerous and highly heterogeneous studies (a number of aquacultural research projects in various parts of the world). The knowledge metric employed in assessing projects like these must be flexible enough to accommodate such variety, yet permit pooling into a single econometric model of the associations between knowledge-gained and resource-expended. In particular, it must overcome the data and conceptual problems of distinguishing program influences from other factors affecting the fish-farm setting. Much of our effort was devoted to dealing with, and taking advantage of, cross-study heterogeneity.

Results
Results implied productive efficiency declines as research project size is expanded; scaling research team FTE and education up and travel distance down produce declining research input efficiency. This implies that typical research projects size in our data set was too large. Decreasing returns to scale signify a fixity in the research inputs excluded from our computations. Many such inputs clearly have not, from the evidence of our regressions , been captured in the present analysis. But others are present in the form of the research outcome dimensions and

topic-area categories. Each confines what the investigator is examining and hence implies a constraint in its own right, limiting the possibilities for efficient scaling-up of research effort. Experiment and survey sample sizes, which vary by treatment, outcome dimension, and survey question as well as by investigation, ought by statistical theory to have a negative effect on posterior variances. In our results they appeared to have no impact at all. Collaborator hours and education also were nonsignificant, and road- and transportation-type effects were non-robust. Stratification of the analysis by topic-area category required too many observations to be feasible.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #12

1. Outcome Measures

Change Indicator 1 - Ecological / Environmental o Landscapes will impact the way Oregonians use and manage plants to create beauty, modify environment, and improve health and well-being of individuals and communities. This program will change the way people use plants to modify their environment such as moderating temperature on buildings, improving water infiltration on surfaces, contributing to ecosystem services at landscape or watershed scales, etc. o Food/farm systems reduce surface and/or groundwater or other pollution in the environment, while improving nutrient and water budgets, and organic production systems. o New reduced risk, environmentally safer pest control tools will be available that are target pest specific will facilitate the implementation of IPM programs. o Environmental change will occur from temperature modifications; enhanced water conservation and wildlife; reduced runoff, fire incidence and pests; improved nutrient use and recycling; and other ecosystem services. o Better ecological methodologies will lead to more social, economic, and environmental benefits and cost effective and sustainable restoration. Improved valuation of ecological services associated with restorations will greatly facilitate market-based conservation practices such as mitigation banking and effluent trading. Better conservation bio-control strategies will decrease the costs associated with insect losses and the use of insecticides. o enhance the nation's natural resource base and environment by revealing cost-effective means to control plant diseases and reduce the need for pesticides. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Improved soil, water, and crop management practices and strategies that protect Oregon resources o Management of public and private rangelands will sustain and improve ecological values as desired by the public and the rural communities that depend on the natural resources. o Strategies for avoiding invasive pests will be in place o Plant disease resistance will lower the amount of pesticide use, resulting in a more healthful environment and reduced exposure of humans to hazardous chemicals.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Landscapes provide us with a number of goods and services but changes in climate and land use could alter the provisioning of these services. To mitigate these impacts we need better predictive models describing what the expected impacts will be and precisely where in landscapes the impacts will be the greatest. In many cases we poorly understand how different agricultural systems vary in the types and amount of ecosystem services that they provide. We need a better understanding of the roles different agricultural systems play in the provisioning of ecosystem services in order to develop better strategies and policies for enhancing and maintaining these services.

What has been done
Interdisciplinary projects are quantifying expected changes in ecosystem service provision, use, and value on a rapidly changing rural-urban fringe landscape in the Northern Willamette Valley, Oregon. We determined the biophysical provision, use, and economic value of ecosystem services that currently exist, and engaged policy stakeholders to explore the interaction of ecosystem service science, scale, and complex policy negotiations. Additionally, we are developing guidelines regarding generalist predator insect habitat on Pacific Northwest farms. We developed and refined habitat-based models that describe how the occurrence and diversity of beetle species varies seasonally and across habitat types on our study farms.

Results
To date, we have developed a novel rapid ecosystem service assessment method that greatly facilitates data collection for ecological functions at the site scale. We also developed an approach for integrating this site scale information with spatially explicit ecosystem service model estimates made at larger spatial scales, which has the potential to validate findings from those ecosystem assessments. This contributes to new knowledge in geographical and spatial sciences and improves the accuracy of economic assessments. Our work with generalist predators has introduced regional farmers to the ecology, biology, and potential ecological services that predacious ground beetles provide farms. We provided farmers with practical recommendations based on the findings from two seasons of research at outreach events that also trained farmers to evaluate their farms in terms of beetle habitat and to institute practices that can enhance this habitat on their own farms. Preliminary analysis of surveys given to our participating farmers indicates that our farmer to farmer exchanges and short course activities have increased knowledge about the value of beneficial predator habitat, and have provided practical guides for integrating that habitat in typical farming systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area

102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
205	Plant Management Systems
216	Integrated Pest Management Systems
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #13

1. **Outcome Measures**

Change Indicator 2 - Societal o Social change will occur through new perceptions of green technologies and social value or capital of horticultural landscapes to enhance human health, therapy, wellness, and social networks. o Social impacts include consumer awareness and appreciation of the abundance of locally grown ornamental plant materials and native species for use in landscapes will increase; also awareness of invasive species. o Social change will enhance quality of life in rural areas by improving economic stability of family farms, wineries, wine tasting, and tourism with new practices and cropping systems and/or livestock management practices/systems. o Social change will improve economic stability of families and quality of life with improved cropping systems. o Worker safety with bio-based pest control and dwarf rootstocks (short ladders) will be improved; farm workers will find other employment with increased mechanization. Local and community markets increase social networking in rural communities. o Increased opportunities for rural community marketers and processors will be developed; o Public health will be improved through the use of crops with improved nutritional value o Sustainable and economically viable wheat and dryland cropping industry for vibrant rural economy in eastern Oregon o The public has access to an ongoing research data base that allows for natural resource/land management decisions to have a fundamental basis in science.

Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

Change Indicator 3 - Economic o The economic value of landscapes will increase. Cost and benefit analyses of plants usage to modify environments with green technologies will reveal positive economic impacts and improved health and wellness from horticultural therapy. o Economic impacts include reduced costs, increased benefits, and production efficiencies from use of water and nutrient budgets in recycled water systems, improved pest management, and diagnosis of plant problems to increase sales of quality products. Costs of regulatory procedures will be reduced with water and nutrient budgets and management systems. o Profitability of berry crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Machine harvest technologies will be adapted or developed for Oregon to reduce production costs and improve competitiveness in global markets. o Profitability of vegetable and specialized seed crops is expected to improve as new cropping systems, cover crops, nitrogen management, reduced tillage, and cultivars are adopted by growers. Communication networks will enable timely communication and utilization of technologies to alert growers of weather related pest

incidence, educational events, and practices. o Profitability of viticulture in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Niche markets, wine tasting, and tourism are primary outlets for Oregon wines. o Profitability of tree fruits and nut crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. High density orchards are expected to improve production efficiencies and increase markets. o Agricultural producers will realize greater economic return in their cropping enterprises; Plant nutrient and other production input use will be optimized o Producers maximize the control of postharvest decay within the various production and marketing objectives of producers. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Higher-value niche markets will be established o Beef producers in the Intermountain and Great Basin areas remain completive on a regional, national, and global basis. o Producers greatly improve their reproductive efficiency by removing bad genes thus increasing productivity and economics of the industry. Industry thus has improved resource and economic sustainability through reduced costs and/or increased productivity. o Better understanding of the costs, benefits, and potential impact of legislation on the dairy industry, and thus more economically and environmentally sustainable systems for dairy and beef production. o Intense selection reduces needs for assistance in pasture lambing conditions. o Economic viability of farmers markets will be enhanced o Agricultural producers will realize greater economic return in their enterprises; o Increased potato yield will increase potato farmers' income as well as the stability of potato production of the world. The potential increase from 29,000 acres to as much as 100,000 acres will increase Oregon's market share and economic benefits.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2011 cattle was again the top commodity, with sales rising 12.8 percent to $799.8 million as droughts in Kansas, New Mexico, Oklahoma and Texas decreased the amount of grass for grazing and forced ranchers in those states to cut back their herds. Although U.S. inventories dropped, demand from consumers continued and prices rose. Oregon producers strive to manage both their herds, feed lots, cow-calf production, as well as their rangeland environments.

What has been done
Our faculty in beef research and extension monitor industry progress and continue to exchange information at annual meetings and field days, such as the Beef Industry Tour and In-Service

Training, Range field days. Research is conducted in concert with industry members, U.S. Forest Service, Bureau of Land Management, and nonprofits such as The Nature Conservancy in dryland, mixed forest and sagebrush rangelands.

Results
The industry is trying to reduce the stress on the cattle so they produce better beef. Stress can change the metabolic processes of the body. If the calves are stressed before they go to slaughter, their meat will look darker and drier and may be tougher. That?s not good for the consumer or the animal. So we?re seeing improvements in how animals are housed, handled, and transported to reduce as much stress as possible. Furthermore, most Oregon cattle producers are striving to improve the land, particularly with improved riparian management. Years ago, cattle had access to a stretch of stream for a significant amount of time. Now, ranchers move their cattle more often, grazing near streams only during a time of the year when the cattle will eat just the grasses and not the woody material, and then rotating them to another pasture. Studies of the impact of cattle grazing on riparian areas have been ongoing since 1993. In a nutshell, we?ve found that grazing can be done in a way that is compatible with protecting the environment, wildlife, aesthetics, and recreational interests.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal 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
607	Consumer Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #15

1. Outcome Measures

1b - sustainable gardening practices (eg. fertilizers, water, and pest management including organic), horticulture and aboriculture principles and practicea

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a general lack of appreciation on the role of insects in agroecosystems, and we are losing our biological legacy as insect populations are threatened. This is compounded by a lack of biological information to inform decision making regarding land use, species conservation, and habitat restoration. Insects are excellent indicators of environmental conditions, thus, an understanding of the taxonomy of insects, protocols required for obtaining suitable insect samples, and data interpretation are very important in addressing climate change and insect pest management.

What has been done
Travel has been completed to a number of locations to investigate insect ecosystems. These include South Korea (natural enemies of the spotted wing Drosophila, SWD). Thailand (field studies on insect biodiversity in National Parks), Ecuador (integrated pest management in a variety of cropping systems, insect biodiversity). Other activities include over a dozen presentations, along with preparation of manuscripts, a book, and two websites.

Results
We have developed new knowledge of effective parasitoids for Brown Marmalated Stinkbug and for Spotted Wing Drosophila through our travels in Asia where they are native. These natural enemies have not yet been adopted as control measures in the field, but they hold great promise for management of both of these introduced pest. Collaborators identified throughout Southeast Asia have adopted project objectives, methods and means of data interpretation. These collaborators collectively have or are preparing grant applications for additional funding both in the U.S. and abroad.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #16

1. Outcome Measures

1c - dryland production management systems use agronomic practices for commercially promising alternative crops under reduced tillage. * Producers, NRCS, conservation districts and environmental agencies learn about whole farm nutrient management. * Basic agronomic practices for commercially promising alternative crops under reduced tillage systems.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Alternative and rotational crops remain a priority for our growers. Natural rubber (NR) is essential for manufacturing a wide array of industrial products, e.g., modern aircraft cannot land safely without natural rubber tires. All commercial NR is produced in the tropics and prices have increased six-fold in the past 10 years. The U.S. uses over $6 billion worth of raw NR annually, and is 100% dependent on imports. Five SE Asian nations (including China) control 90% of the world?s NR exports. NR is classified as a ?strategic material? due to its importance in high-performance applications. Despite 70 years of lab research, chemists are still unable to create synthetic rubber that has the required high-performance characteristics found in NR.

What has been done
We harvested additional TKS roots and seed from the small 2012 field experiment at KBREC (evaluating some improved germplasm and comparing planting methods). The roots were shipped to Ohio for rubber extraction analysis. The collected seed will be cleaned and used in germination studies and possibly for 2013 field plantings too. Preliminary growth chamber experiments were done using seed produced in Oregon and Ohio. Additional germination studies were also done by cooperators at Ohio State University this quarter. It is becoming clear that a seed treatment combining cold and moisture greatly enhances germination, but details on how to practically achieve this result still need investigation.

Results
Results from this small trial will provide valuable information to apply to the 2013 larger field trials. To continue examination of the seed germination portion of this project. We also plan additional work with seed germination and plant growth chambers.

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
601	Economics of Agricultural Production and Farm Management

Outcome #17

1. Outcome Measures

1d - irrigated production management systems use drip and micro sprinkler irrigation systems to produce increased crop yield and crop quality with less water and nitrogen than with furrow and regular sprinkler irrigation

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increasing efficiency and decreasing inputs (labor and chemical inputs) in vineyard management is an important goal for Oregon wine grape producers. They have the highest production costs per acre in the nation due to small production size and high-tier quality production market. It is critical for growers to have a sustainable and efficient vineyard system while also keeping their production goals in mind. The reduction in chemical inputs (fertilizers, pesticides, and fuel) is both economically and environmentally beneficial.

What has been done
Research addressed sustainable management of young vineyards using cover crop mulching. A 3-year trial in a commercial vineyard used a winter annual cover crop grown and managed in different ways during spring to provide soil moisture retention and allow for organic amendments (nutrition) addition to the soil. Results of this trial indicate that cover crops can be grown then

mowed and the biomass used as an in-row mulch to impact soil moisture and vine growth during vineyard establishment. The use of a mulch layer in the vine row increased soil moisture conservation, reduced weed growth, and increased vine canopy growth, root development and increased fruitfulness. Results are posted Online and through courses and field days.

Results
Vineyard cover crops can be grown and managed in different ways to reduce inputs of herbicide, fertilizers and irrigation. We estimate a potential cost savings of $3,180 per acre during the establishment years for those vineyards that use these mulching methods. One of the biggest savings was in water savings as no irrigation was required during establishment.

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
602	Business Management, Finance, and Taxation
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #18

1. Outcome Measures

6b - Improved knowledge of consumer and market conditions and factors that affect business survival and competitiveness - Improved understanding of market conditions and knowledge to determine business choices. - Development of a process map for food business development and planning. - Training of nascent and existing food entrepreneurs in food business management. - Expanded knowledge base of factors important to distinguish different types of consumers and their food choices - Develop an understanding of motivations for food choice and strategies to impact them - Improved marketing approaches for local markets and community food systems

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New and emerging food processing technologies need to be investigated to produce high quality and wholesome value-added products and improve efficiencies in processing. Research and outreach activities can then be specifically integrated to assist the food sector in food safety and in maintaining a wholesome food supply.

What has been done
Two pilot projects in traceability were successfully implemented in a OR and WA processing facilities and showed that a RFID enabled tracking system was proved to be technically feasible.

Results
The pilot RFID system generated valuable information to improve productivity and efficiencies in a food processing plant, reduce human errors caused by paper based tracking system, and improve the speed for food safety recalls.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
607	Consumer Economics

Outcome #19

1. Outcome Measures

4b - identify genes involved in critical plant processes to improve plant qualities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Eastern filbert blight (EFB) caused by the fungus Anisogramma anomala is a devastating disease of hazelnut in Oregon. The OSU hazelnut breeding program is developing new EFB-resistant cultivars and pollinizers. New sources of EFB resistance are being identified and studied. New knowledge of hazelnut genetics is being pursued.

What has been done
Crosses in the hazelnut breeding program emphasize combining resistance to eastern filbert blight (EFB) with suitability to the blanched kernel market. EFB-resistant selections were used as parents, and seedlings from controlled crosses were planted in the field. DNA marker-assisted selection is used annually to identify seedlings that carry the dominant EFB resistance gene from 'Gasaway'. Replicated trials of advanced selections are planted each year and retained for further evaluation. Simple sequence repeat (SSR) markers were used to study genetic diversity in Corylus americana and interspecific hybrids.

Results
Cultivar 'Dorris' (OSU 876.041) and pollinizers 'York' (OSU 878.048) and 'Felix' (OSU 941.016) were released in February 2012. New sources of EFB resistance were identified; resistant selections originated in southern Russia and the Crimea (Ukraine). EFB resistance in 'Gasaway', OSU 408.040, 'Culpla', 'Crvenje' and OSU 495.072 (from southern Russia) all map to the same region on linkage group 6. Resistance from 'Ratoli' maps to linkage group 7 and from Georgian selection OSU 759.010 to linkage group 2. The incompatibility alleles of hazelnut cultivars and selections, identified over the past 30 years, were summarized. SSR markers showed that our collection of Corylus americana is highly diverse, but that hybrids have a much narrower genetic base.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
206	Basic Plant Biology

Outcome #20

1. Outcome Measures

5b - 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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Grapevine is recalcitrant to transgenic technology, whereas traditional genetic breeding for improvement of disease resistance and other useful traits is undesirable since crossing grape varieties eliminates the identity of grapevine varieties traditionally used in wine making (e.g., Pinot noir, Cabernet sauvignon, Syrah, Chardonnay). Utilization of a RNA virus-based vector avoids the need of either grapevine transformation or breeding for introduction of traits. Therefore, such a vector has high potential impact on grapevine functional genomics and disease control. A few examples of the vector?s utility are identification of the grapevine genes responsible for the flavor or disease resistance, as well as engineering vector variants targeting grapevine pathogens such as other, more pathogenic viruses, arthropods, or fungi.

What has been done
The Grapevine leafroll-associated virus-2 (LR2)-based vector for expression of recombinant genes was generated, and a technology for introduction of this engineered vector into grape via agroinfection was developed. Furthermore, it was shown that LR2 vector has a powerful ability to induce RNA interference targeting endogenous grape genes also termed virus-induced gene silencing (VIGS). This vector is genetically stable, being capable of expressing recombinant genes for at least over a year. The vector variants targeting important viral and fungal pathogens of grapevine were generated and are being tested for conferring pathogen resistance. In conclusion, LR2 vector has a very significant potential for the functional genomics and pathogen control in grapevine.

Results
Generation of the LR2 vector variants for virus and fungus control and beginning of the protection assays signified the beginning of the commercial application phase of this effort. Together with Vinoculate, Inc., we continue to seek involvement of additional business partners to fund the commercialization phase. We have published the results of our work on the vector in two papers that appeared in Virology and Journal of Virology. We have also collaborated with the researchers from UC Davis to characterize a novel grapevine virus and published our observations. The results of our work were reported at 6 national and international scientific conferences and seminars and used in student training in the framework of Botany 332 Lab Techniques in Plant Biology class (2012). In addition, we have established ongoing collaboration with University of Basel (Switzerland) to investigate the RNAi response of grapevine to LR2 vector and other grapevine viruses. The US patent application covering the developed technology was filed by OSU in 2008; the corresponding patent was issued by South Africa in 2011.

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

Outcome #21

1. Outcome Measures

5c - Elucidation of the underlying molecular mechanisms of pathogenicity (virulence), disease susceptibility (compatibility) and disease development, gene evolution, and engineered gene expression vectors

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We need insights for the control of wide-ranging and serious diseases such as Pyrenophora tritici-repentis (Ptr), a necrotrophic fungus and the causal agent of tan spot of wheat, a disease of significant economic importance worldwide. We then could develop resistant germplasm, enhance economic opportunities for agricultural producers, and enhance the nation?s natural resource base and environment by revealing cost-effective means to control this, and other plant diseases, while reducing the need for pesticides. Molecular mechanisms in the Ptr produces one or a combination of host-selective toxins (HSTs) that are required by the fungus for disease on wheat; two HSTs produced by Ptr are Ptr ToxA and Ptr ToxB.

What has been done
We conducted a comparative analysis of the transcriptional changes induced by two of the host-selective toxins, ToxA and ToxB, produced by Ptr on wheat. We also sequenced the genomes of three Ptr isolates. A pathogenic isolate known to produce Ptr ToxA was used to assemble a reference nuclear genome. We did a comparative analysis of the reference genome with those of a pathogenic isolate, known to produce Ptr ToxB, and with that of a nonpathogenic isolate. Extensive transcriptional reprogramming occurs due to ToxA treatment and that these include cellular responses typically associated with plant defense. Our studies also demonstrated that ToxA-induced cell death is triggered by impairment of the photosynthetic machinery and

accumulation of reactive oxygen species.

Results
Based on our results, we propose that ToxA acts as both an elicitor and a virulence factor (HST). Transcriptional and biochemical responses as well as symptom development occur more rapidly for ToxA than for ToxB. Our studies support that host perception of HSTs result in activation of defense responses as part of a susceptible interaction. Results of our comparative genomics study provided candidate pathogen-specific proteins, identified gene families that may play a role in a necrotrophic lifestyle, and showed the nonpathogen genome is more diverged than that of the two pathogens. Additionally, transposable elements may play a role in the creation of novel genes in the pathogens, effector diversification, and identified the first example of transduplication by DNA transposable elements in fungi. Together, these data indicate that pathogenicity in P. tritici-repentis arose through an influx of transposable elements, which allowed for genetic flexibility that can easily respond to environmental changes.

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

Outcome #22

1. Outcome Measures

7 - integrate agricultural education into high school curriculums and community education

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agriculture in America continues to play a vital role in our nation's economy and national security. Vital to the continued success of this industry, and the nation as a whole, is a well-informed literate society with regard to knowledge about agriculture. The ability to produce food and materials for human usage is a system in which the average American has taken for granted. As special interest groups involved in issues such as animal rights, pesticide usage, soil and water conservation, and other environmental concerns gain media and public attention, it becomes even more important that the general public have some background and understanding of not only what agriculture is all about, but of how it affects each person's life on a daily basis.

What has been done
We are participating in the redevelopment of the multistate project related to agricultural literacy (WDC027). The group is currently creating a curriculum map project for the National Ag in the Classroom Program in partnership with other non-profit foundations. The Map, which includes food, agriculture and natural resource standards and benchmarks for K-12 grades will be cross-referenced to common core academic standards in language arts, social studies and mathematics. Also, it will be cross-referenced to the National Science Standards. This will result in an agricultural literacy curriculum map that will serve as a basis for assessment of academic core knowledge and agriculture, food and natural resource knowledge.

Results
The map project will greatly enhance the ability of educators to integrate agriculture, food and natural resource across the K-12 curriculum and to understand the contribution that the agricultural literacy context makes to increasing student achievement in academic core subjects and in agriculture, food and natural resources. In the meantime, we continue to collaborate in the Oregon Agriculture in the Classroom activities, conduct agricultural teacher preparation in the College of Agricultural Sciences at the bachelor and master levels.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #23

1. Outcome Measures

A1a - plant management tools are used by private and public sector, for example: * Farmers will more strategically plan for crop production * Crop rotation sequences and green manure crops in combination with reduced or no nematicide use, particularly for short season potato crops to suppress nematode populations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Columbia root-knot nematode (Meloidogyne chitwoodi, CRKN) and Stubby-root nematodes (Paratrichodorus allius, and some other trichodorid species, SRN) infects potato tubers, causes quality defects and can cause crop rejection even at low incidences. In 2008, a field at an Oregon State University farm (planted to potato in 2007) was sampled and found to contain cysts of Globodera which were morphologically and molecularly distinct from golden potato cyst (G. rostochiensis), pale potato cyst (Globodera pallida), and tobacco cyst (G. tobaccum). These nematodes were recently described as a new species, G. ellingtonae. Very little is known about the biological properties of this species and its potential pathogenicity to potato or other crop plants.

What has been done
Approaches to address Columbia root-knot nematode infection of potato tubers included 1) screening cultivars of rotation crops for host status in an attempt to reduce population increase between potato crops, and 2) evaluating methods of destroying CRKN in tubers to augment inspection procedures and ensure no live CRKN would be released into the environment of an importing country. Management of CRS was investigated by 1) screening potato germplasm for extent of symptom expression and 2) the effect of green manure cover crops on symptom expression in a following potato crop. Investigations of the host status of G. ellingtonae were pursued by exposing eggs to root diffusates of different potential host plants and inoculating different potato varieties with a known number of eggs.

Results
CRKN host status were least with Basin/5770/5808 sweet corn, Vaquero onion, Uppercut carrot, Naches pea, and 37Y12/35K02/P0125 field corn. A hypothetical cropping sequence of sweet corn cv 5808 - field corn cv P0125 - pea cv Naches - a pea cover crop in the fall was estimated to reduce 100 CRKN to 0.2/250 g soil. Effective destruction protocols for eliminating live CRKN from potato (either whole tubers or peels) were heating potato peels and associated water to 60 C or above, submersing whole tubers in water at 80 C before peeling, or irradiating tubers in boxes. CRS symptom expression was high (>35%) in Yukon Gold, Canela and RioGrande, and low (<10%) in Centennial, Russet Nugget and Russet Norkoth. Further, six clones had an average incidence less than 10%; CO99100-1RU, AC96052-1RU, CO98067-7RU, Chipeta, Classic Russet, and CO97087-2RU. Of the green manure crops evaluated for potential to suppress CRS in a following potato crop, radish cultivars Terranova and Doublet supported the lowest reproduction of stubby-root nematodes. Eggs of G. ellingtonae were exposed to root diffusates from a wide variety of plants (23) but only hatched when exposed to those of tomato or potato.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
206	Basic Plant Biology

216 Integrated Pest Management Systems

Outcome #24

1. Outcome Measures

A5 - pest and pathogen management tools are used by growers, for example: * End users adopt new pesticide and pest management systems and strategies for working with invasive pests * District-specific control programs will reduce usage of fungicides with low efficacy and emphasize integrated control practices. * Growers, packers and extension faculty incorporate practices to lower decay risk, including reduced fungicide usage, and identify high risk fruit lots and to market these before decay has time to develop in storage. * Interaction of program components and the overall efficacy of various combinations of orchard, postharvest, and storage factors will be the guides to the description of programs for implementation in the pear industry. * Determine packinghouse water system contamination by fungal pathogens. Commercial service lab can apply PCR technology to maintain sanitation determine most effective fungicides for each species. * Customized decay control program for each unique pathogen complex.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Efforts to develop strategies for yellow nutsedge control in onion and sugar beet continues. Since the introduction of glyphosate resistant (GR) corn in 1998 and sugar beet in 2008, the acreage planted to GR crops has been increasing. It is estimated that nearly 100% of corn and sugar beet grown in the Treasure Valley (TV) of Oregon and Idaho is glyphosate resistant. In turn, glyphosate has become the herbicide of choice for weed control in fields planted to GR crops. The use of herbicides with a single mode of action tends to exert great selection pressure on the weeds. Herbicide resistant weeds have become a major concern to TV farmers although no glyphosate resistant weeds have been identified yet.

What has been done
We studied the biology of yellow nutsedge varieties and the use of soil active herbicides as tankmix partners with glyphosate. We also conducted educational activities to create grower awareness of production activities that exert selection pressure and results in development of herbicide resistant weeds. Growers were advised to practice diversified crop rotation schemes, which are always accompanied by the use of herbicides with different modes of action. We also

encouraged growers to avoid repeated use of glyphosate alone to control weeds in glyphosate resistant crops. Growers were reminded the importance of using integrated methods to manage weeds.

Results
The importance of crop rotation and corn as an effective crop in managing yellow nutsedge is starting to take hold among growers. Corn acreage in the Treasure valley has increased from 8,500 ha (21,000 acres) in 2006 to 10,920 ha (26,980 acres in 2011). Growers have also started using soil active herbicides (Dual II Magnum and Outlook) in Roundup Ready corn and sugar beet; this practice is expected to significantly reduce yellow nutsedge tubers compared to using glyphosate alone. Evaluations conducted at the end of each grower presentation indicated that growers had gained knowledge to help them recognize factors that contribute to selection for herbicide resistant weeds. Growers now recognize that growing corn provides an opportunity to use mechanical and chemical weed control to manage yellow nutsedge in the years preceding onion. They know that proactive management of weeds using herbicides with multiple modes of action could reduce the selection pressure and may help minimize or delay the development of resistant weeds in the region. The impact of crop rotation will continue to be assessed in out years.

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
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #25

1. Outcome Measures

A7 - agricultural education produces the next generation of growers and eduactors

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2012 1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Motivated students are needed to replenish the rapidly aging agricultural population as well as to position American agriculture as a sustainable, worldwide leader. Very little research exists that examines student motivational, engagement, retention and success variables in the context of agriculture. This research project carefully examines the influences on college student motivation and engagement to identify ways to improve them to result in a larger, more diverse and educated workforce. With an increasingly competitive job market, we are dedicated to providing opportunities for students to set themselves apart from their peers.

What has been done
Partners in the agriculture industry have indicated students of College of Agriculture Sciences leave OSU with remarkable technical skills but in many cases need some additional development in the soft skills also critical for career success. The College of Agricultural Sciences responded by creating the Leadership Academy.

Results
The Leadership Academy is a one-year, not-for-credit program open to all undergraduates in the Colleges of Agricultural Sciences and Forestry. Selected students evaluate their leadership strengths and areas for growth and set goals for long- and short-term leadership development. Working closely with a faculty mentor, students identify on- and off-campus activities, professional development workshops and organizations that will help them take steps toward reaching their leadership development goals. The academy's hallmark is the one-on-one mentoring component. Employers who want a well-rounded student who can come into a company and make an immediate impact, one who understands the importance of personal skills, communication, critical thinking and teamwork, then they need to go after Leadership Academy students," said Jonathan Velez, who teaches in the Academy and holds the newly endowed Terence Bradshaw Leadership Academy Professorship.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #26

1. Outcome Measures

A6b - consumer business knowledge leads to improved opportunities, survival, and profitability in food enterprises, as well as new and improved value-added products - New and existing businesses expand markets based on new understanding about market factors - Increased business activity and success in the Northwest food industries. - More successful starts by food businesses

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Competitiveness and the success of the US food processors and producers can be enhanced by providing the industry with a better understanding of the marketing conditions they face and marketing strategies they may employ. Additionally, competitiveness can be improved by providing agricultural producers and processors with direct access to information from consumers on their opinions and attitudes about food products they choose to consume.

What has been done
Sensory tests for consumers were also run for high-fat yoghurts, health bars, potatoes, berry juices and a variety of seafood products. A survey was held various urban centers to better understand consumer perceptions of the quality and safety of raw milk cheeses. A series of 2 hour workshops on product development were also given at the FIC. Food product development work continued with a variety of products including lentil burgers and a pear puff product made from average quality pears.

Results
A collaborative project with ODA linked artisanal cheese makers with buyers and media has led to held. Several food start-up companies have been launched and others are expanding their operations through efforts at the FIC and through its collaborators. Collaborative efforts in product development continued though the Get Your Recipe to Market workshops held twice a year at Portland Community College and the Noodle Workshop at the Wheat Marketing Center. Follow-up efforts with some of these companies have assisted them with product development and meeting new marketing challenges.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

603	Market Economics
607	Consumer Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #27

1. Outcome Measures

1e - Protection of natural environment from agricultural chemicals, for example: - Reduce the fate of agricultural chemicals in remote aquatic ecosystems - Improve policies or regulation of pesticides

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dr. Stacy Simonich studies how air pollution navigates the globe and ends up in our soil, snow, water, and bodies. She investigates if airborne dust contains pesticides and polycyclic aromatic hydrocarbons (PAHs). The latter are produced when coal, gas, and wood are burned or even when meat is grilled or smoked. PAHs can piggyback on dust and travel thousands of miles through the air. Some cause cancer.

What has been done
On the 9,000-foot Mount Bachelor in Oregon, Simonich tested whether pollutants from Asia hitchhiked on the wind over the Pacific Ocean and landed there, something that can happen in as few as five days. She found that Mount Bachelor visitors had been breathing in PAHs from China and from urban and fire-damaged areas in the western United States. Mount Bachelor is also a landing pad for chemicals from nonstick cookware coatings and stain repellants found on carpets and clothing. She traced these latter compounds to urban areas in the western United States, and to a lesser extent, Asia.

Results
Understanding what chemicals are in the air and where they come from will help U.S. regulators understand how global pollutants affect U.S. air quality. A member of a National Academy of Sciences committee that studies pollutants entering and leaving the U.S., Simonich is continuing collaborative work with Chinese counterparts examining the impact of burning fuels like coal and biomass on the health of residents in the United States and China. With Professor Shu Tao at

Peking University, with whom she worked on the Olympics air quality study in 2008, she will carry out research to help determine the cancer-causing potential of certain air masses-and where they came from. The scientists will collect air samples at multiple locations, including China, Japan, and several places in Oregon. Funding for this work comes from the National Institute of Environmental Health Sciences and the National Science Foundation. She also continues to advise Saudi Arabian scientists on their airborne pollutants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

formative evaluation is still ongoing, methods are being assessed.

Key Items of Evaluation