

Plan of Work Update

for

FY 2005-2006

Washington State University

Agricultural Research Center

**College of Agricultural, Human, and Natural
Resource Sciences**

Submitted to USDA-CSREES

April 1, 2004

The FY 2005-2006 Plan of Work Update for the Agricultural Research Center, Washington State University, Pullman WA

A. General

1. Planning Option

The Washington State University Agricultural Research Center (ARC) has chosen to update the Revised Plan of Work (POW) previously submitted by its director, Ralph P. Cavalieri, on May 29, 2001, for the period October 1, 2004 to September 30, 2006. [The first revision of the POW occurred in order to arrange our plan under the Research Project Areas (RPA) and Key Themes recommended by Planning and Accountability in the Office of the Administrator of the USDA-CSREES.] As with the previous Plan and its 2001 revision, the Agricultural Research Center and the College of Extension are submitting separate updates on the POW.

In general, the present update for FY 2005-2006 follows the same research programs and themes as previously laid down in both the first Plan of Work and its Revision, with the exception that many of the original projects in the 1999 Plan of Work and the 2001 revision have terminated and have been replaced with new projects based on the results achieved in the original projects. We have experienced a turnover in projects for several reasons: (1) A number of the faculty members have retired and we have made new faculty hires, which has added to our project portfolio. (2) Also, many of the original projects have concluded and have been replaced by new projects built on similar themes utilizing knowledge gained through performance of the original projects. (3) A third and major force, which accelerates turnover of projects in the original POW, is the mandate of our State Legislature directing our faculty members to perform three-year rather than five-year projects. The effect has been a rapid evolution of the portfolio of projects in the ARC.

The present Update of the POW follows the goals set down in the original POW and continues to emphasize a Food Systems approach. Seven years ago, Experiment Station Director, James R. Carlson, who crafted the original Plan of Work, mandated a Food Systems focus for the work of the ARC in the face of declining state support for higher education. Since that time, we have continued our work on food systems; and we are retaining that focus for the period October 1, 2004 – September 30, 2006. Further, we are also operating under the directives of WSU President Rawlins' new Strategic Plan, which emphasizes a world-class undergraduate and graduate education for students, and the scholarly themes of biotechnology and preserving and protecting natural resources and the environment. The latter two themes were also part of the first revision of our POW. Thus, our President's plan is not inconsistent with what is to be achieved in the revised POW (2001) and in the present 2005-2006 update of the Plan.

Projected Resources (human and fiscal measures) based on research and extension funding for FY 1999 (baseline)

	FY 1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005**	FY2006**
Hatch	2,042,835	2,043,113	2,038,092	2,038,580	2,017,883	2,017,883*	2,000,000	2,000,000
Multi-State	1,466,617	1,465,967	1,473,102	1,473,102	1,463,618	1,463,604	1,400,000	1,400,000
McIntire-Stennis	322,984	323,227	315,351	320,751	308,019	308,019*	300,000	300,000
Animal Health	12,043	13,390	13,384	10,872	8,154	8,154*	8,000	8,000
State Funds	18,540,663	17,418,085	17,342,410	17,342,410	16,508,502	16,650,000	16,650,000	16,650,000
FTE	418.34	422.59	400.32	390.23	398.36	400	400	400
	*FY2004 not received							
	**All estimated							

How we are planning to address critical short term, intermediate long-term issues in the state. We shall address these issues by mechanisms already set in place including the research and extension programs at our Research and Extension Centers and Units placed around the State, with state, commission, industry and federal dollars. In the face of declining state appropriations, we will place emphasis on faculty members’ accruing more external support from other federal sources (e.g. USDA, DOE, NIH, NSF, etc.) and industry partnerships. We will also employ team efforts across colleges at the university, multi-state efforts and integrated research and extension efforts.

How we are being part of the five national goals. Our investment in the five national goals is apparent from the array of projects found on pp. 4-27 of this Update of the POW. The majority of our projects are under goals one and four because agriculture is the number one industry in Washington. Due to the ongoing interest in food safety, food quality, human health and biosecurity, goals two and three have accrued a number of projects emphasizing food and health (an obvious national trend). Our smallest number of projects, however, is found under goal 5. We have a small social sciences faculty, the majority of which is in Community and Rural Sociology. Our College of Extension, however, performs work in many of the areas listed under national goal 5.

Based on the College and University Strategic Plans we expect to continue to conduct a “high-quality, productive relevant and recognized research program with areas of excellence and high impact on the regional, national and global food system.” Our emphasis in new areas will encompass biotechnology (as stated in the Plan) with an added emphasis in Biopharming. Within the past year we have seen an effort across our colleges at WSU to organize a school of environmental sciences. Should this happen, the ARC faculty expect to play a large part in the ensuing collaborative efforts.

We fully expect to be responsive to stakeholder needs. We are now pursuing a program in organic and sustainable agriculture, which has been essentially stakeholder-driven by groups in Western Washington. Not only is there an undergraduate curriculum in organic

agriculture being developed in the College, but federal initiative money has appeared. The Paul Allen Foundation (Vulcan) has contributed \$3.75 million for a “Climate-friendly farms” project, which also ties in to the project.

Another stakeholder driven effort is in viticulture and enology. Washington has tremendous potential for excellent wine. A decade ago only a few business existed and now there are over a hundred wineries in the State. Once again, a curriculum has been developed in viticulture and enology and new faculty with expertise complementary to the already existing faculty are being hired. The program is being financed through commission and state dollars. Research programs are being built.

As illustrated, we are attempting to be responsive to the needs and wishes of our clientele in a number of new areas and to anticipate their long, intermediate and short term needs.

I, Ralph Cavalieri, [_____signature on file_____], Associate Dean and Director of the WSU Agricultural Research Center, certify that this document is the FY 2005-2006 Plan of Work Update for the Washington State University Agricultural Research Center.

The listing below contains the current ARC projects funded by formula funds: Hatch, McIntire-Stennis and Animal Health funds arranged by National Goal and Department. We have chosen to reformat our revision of the plan around these projects. In this Update of the Plan of Work, we have arranged the current projects, research problem areas and programs by academic department or research unit. We believe that the revision below most accurately reflects the content of the programs funded by Formula Funds and their required matching funds in the WSU Agricultural Research Center. We also believe that this current revision addresses a number of important national and state issues including food quality and safety, emerging pest and disease issues in plants and animals, the problem of invasive species, integrated pest management: all important issues here in Washington, nationally and internationally.

Please note the following formatting convention: New RPA’s added to the POW since the preparation of the FY2001 revision are in blue.

GOAL I

AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Department of Agricultural and Resource Economics

Key Themes for work in Agricultural and Resource Economics under goal 1 are **Agricultural Competitiveness** and **Agricultural Profitability**. Departmental goals of (1) assisting targeted agricultural and resource industries to become more effective in

providing their products and services to consumers and to (2) maintain the capacity to work with scientists from other disciplines to address important agricultural, natural resource and community development problems remain the same. An evolving thrust has been to work in resource economics and several new faculty members have been hired in that area.

RPA's which were removed from the previous revised plan of work (2001) in ARE include: 601 Economics of Agricultural Production and Farm Management and 610 Domestic policy analysis have been removed. RPA's 603 Market Economics, 605 Natural Resource and Environmental Economics, RPA 608 Community resource and development economics, RPA 610 Domestic Policy Analysis, and RPA 901 Research Design and Statistics have been added.

Current projects now under goal 1 are:

RPA 602 Business Management, Finance Taxation and Estate Planning

- 0269 Dryland graingrowers income risk management and its environmental impacts
- 0347 Assessing the economic viability of soil conserving farming systems in Eastern Washington
- 0265 The effects of farmland prices

RPA 603 Market Economics

- 0540 Collective reputation: Firm incentives and empirical analysis
- 0549 Analyzing the competitive position of the WA wine grape industry
- 0275 Agricultural Production Processing, Trade and Environmental Quality
- 0303 Economic aspects of growing *vinifera* wine grapes
- 0547 Improving the international competitiveness of the Washington /Oregon Asparagus Industry

RPA 603 Market Economics

- 0343 Policy & competitive changes in agricultural transportation in WA
- 0806 Fruit and vegetable supply-chain management, innovations and competitiveness

RPA 604 Marketing and Distribution Practice

- 0535 The future role of agricultural cooperatives in the industrialized food system
- 0540 Collective reputation: Firm incentives and empirical analysis
- 0278 Selecting operational parameters which both impact and monitor agribusiness performance

RPA 605 Natural Resource and Environmental Economics

- 0275 Agricultural production, processing, trade, and environmental policy

RPA 606 International Trade and Development Economics

- 0275 Agricultural Production Processing, Trade and Environmental Quality

[RPA 608 Community resource and development economics](#)

0998 Rural economic development: Alternatives in the new competitive environment

[RPA 609 Economic Theory and Methods](#)

0269 Dryland graingrowers income risk management and its environmental impacts

[RPA 610 Domestic Policy Analysis](#)

0269 Dryland graingrowers income risk management and its environmental impacts

[RPA 901 Research Design and Statistics](#)

0218 Empirical likelihood, maximum entropy, estimation equations and other computer intensive calculations

0347 Assessing the economic viability of soil conserving farming systems in Eastern Washington

Department of Animal Sciences

The goals of this department remain unchanged: animal production efficiency, developing methods to make animal food and fiber competitive in the global economy and develop new management approaches to ensure good environmental stewardship. However, changes in personnel (retirements and new hires) have produced new thrusts in biotechnology, specifically, in animal genomics. New RPAs added to the program are RPA 304 Animal Genome and RPA 308 Improved animal products (before harvest). RPA 311 Animal Diseases has been removed from the program. Key themes for this department under goal 1 are **animal genomics, animal production efficiency and biotechnology.**

Research Program Areas are now as follows:

[RPA 301 Reproductive Performance of Ruminants](#)

0536 Development of Ex situ bovine spermatogenesis

0706 Germ cell and embryo development and manipulation for the improvement of livestock

0862 Metabolic relationships in supply of nutrients for lactating cows

0913 Molecular mechanisms regulating skeletal muscle growth and differentiation

0301 Reproductive performance in domestic ruminants

[RPA 302 Nutrient Utilization in Animals](#)

0154 Environmental and economic impacts of nutrient management on dairy forage systems

- 0167 Enhancement of dietary energy use for maintenance, growth and lactation by beef cattle
- 0304 Altering fermentation of plant fiber
- 0374 Nutrient management: Feeding for reduced excretion of nutrients by ruminants
- 0569 Nutrient management of dairy systems

RPA 303 Genetic Improvement of Livestock

- 0536 Development of *Ex situ* bovine spermatogenesis
- 0181 Genetic variation in growth, carcass composition, quality and fatty acid composition of Wagyu cattle

RPA 304 Animal Genome

- 0536 Development of *ex situ* bovine spermatogenesis
- 0304 A candidate gene approach for mapping of quantitative trait loci for marbling in Wagyu X Limousin Crosses

RPA 305 Animal Physiologic Profiles

- 0706 Germ cell and embryo development and manipulation for the improvement of livestock
- 0913 Molecular mechanisms regulating skeletal muscle growth and differentiation

RPA 307 Animal Production Management Systems

- 0432 Pre- and post-harvest manipulation of palatability, appearance and lipid composition of red meat
- 0709 Mastitis resistance to enhance dairy food safety

RPA 308 Improved animal products (before harvest)

- 0432 Pre- and post-harvest manipulation of palatability, appearance and lipid composition of red meat
- 0709 Mastitis resistance to enhance dairy food safety
- 0764 Enhancing the global competitiveness of U.S. red meat

Department of Biological Systems Engineering

The Department of Biological Systems Engineering continues towards its original goals of improving engineering equipment for food processing by non-thermal methods and support of precision agricultural systems. Key themes for Biological Systems Engineering under goal 1 include **precision agriculture, adding value to new and old agricultural products, agricultural competitiveness** and **agricultural profitability**.

RPA 132 Weather and Climate

- 0357 Use of simulation modeling and other computer-based tools for decision support in the management of Agricultural Systems

RPA 501 – New and improved food processing technologies

- 0412 Development and application of harvesting and processing technologies for production of value added fruit and vegetables
- 0271 Preservation of Foods by oscillating magnetic fields
- 0990 Technology & principles for assessing and retaining postharvest quality of fruits and vegetables

RPA 502 New and improved food products

- 0467 Improvement of thermal and alternative processes for food
- 0271 Preservation of Foods by oscillating magnetic fields

RPA 601 – Economics of Agricultural Production and Farm Management

- 0357 Use of simulation modeling and other computer-based tools for decision support in the management of agricultural systems

Department of Crop and Soil Sciences

The essential objective of the Department of Crop and Soil Sciences remains the same as in the revision of the POW in 2001: enhance production efficiency and competitiveness of WA agriculture in a global economy. As in other departments, there also has been an evolution of projects and research project areas including the addition of RPA 102 Soil, plant, water, nutrient relationships, RPA 111 Conservation and the efficient use of water, RPA 211 Insects, mites and arthropods affecting plants, RPA 212 Diseases and Nematodes affecting plants, RPA 213 Weeds affecting plants, and 0277 Biochemical Basis of wheat and wild oat seed quality. Key themes in this department under goal 1 are **agricultural profitability, plant germplasm, plant health, plant production efficiency and small farms viability.**

RPA's and projects are as follows:

[RPA 102 –Soil, plant, water, nutrient relationships](#)

- 0182 Impact of no-till on soil quality, physical, chemical and microbial properties
- 0250 Cropping systems research for low precipitation dryland in Eastern WA
- 0363 Nutrient management for improved crop yield and quality for dryland cropping systems
- 0373 Carbon and Nitrogen cycling and management in alternative cropping systems
- 0722 Organic amendments and cover crops in sustainable agricultural systems

[RPA 111 - Conservation and the efficient use of water](#)

- 0102 Characterization of flow and transport processes in soils at different scales
- 0182 Impact of no-till on soil quality, physical, chemical and microbial properties
- 0250 Cropping systems research for low precipitation dryland in Eastern WA

RPA 135 Aquatic and terrestrial wildlife

0297 Management of Riparian weeds in Western Washington

RPA 201 - Plant genome, genetics and genetic mechanisms

0334 Improving spring wheat varieties for the Pacific Northwest

0449 Molecular characterization and manipulation of the wheat genome for crop improvement

1006 Breeding and genetics of barley

RPA 202 - Plant genetic resources and biodiversity

0196 Molecular markers for barley disease resistance genes

0277 Biochemical basis of wheat and wild oat seed quality

0281 Alternate crops for irrigated Central Washington

0282 Germplasm and cultivar development of hop

0332 Evaluation and management of turfgrass species and cultivars

1006 Breeding and genetics of barley

1134 Plant genetic resource conservation and utilization

RPA 203 - Plant biological efficiency and abiotic stresses affecting plants

0175 Adaptation studies of cereal varieties and selections

0232 Breeding and genetics of winter wheat

0250 Cropping systems research for low precipitation dryland in Eastern WA

0281 Alternate crops for irrigated Central Washington

0664 Seed biology, technology and ecology

0688 Developing crops and cropping systems for moisture

RPA 204 - Plant production quality and utility (preharvest)

0175 Adaptation studies of cereal varieties and selections

0359 Early generation and market specific quality evaluation of new wheat varieties

RPA 205 - Plant production management systems

0250 Cropping systems research for low precipitation dryland in Eastern WA

0332 Evaluation and management of turfgrass species and cultivars

0334 Improving spring wheat varieties for the Pacific Northwest

0376 Integrated management of winter annual grass weeds in Eastern WA dryland crops

0688 Developing crops and cropping systems for moisture

0722 Organic amendments and cover crops in sustainable agricultural systems

0747 Nutrient management in Washington tree fruit orchards

RPA 206 – Basic Plant Biology

0449 Molecular characterization and manipulation of the wheat genome for crop improvement

[RPA 211 – Insects, mites and arthropods affecting plants](#)

1006 Breeding and genetics of barley

[RPA 212 – Diseases and Nematodes affecting plants](#)

0232 Breeding and genetics of winter wheat

1006 Breeding and genetics of barley

282 Germplasm and cultivar development of hop

[RPA 213 – Weeds affecting plants](#)

0277 Biochemical Basis of wheat and wild oat seed quality

0400 Biology ecology and integrated management of weeds in potato rotation cropping systems

Department of Entomology

Departmental goals of Entomology include integration of biological control into integrated pest management and to reduce our current dependence on broad spectrum pesticides. Key themes for Entomology under Goal 1 include **apiculture, invasive species, animal genomics, agricultural profitability**. New RPAs for the department under goal 1 include: RPA 123 Management of forest resources, RPA 205 Plant management and production systems, RPA 301 Reproductive performance of animals, RPA 303 Genetic Improvement of Animals, RPA 304 Animal Genome, and RPA 305 Animal Physiological processes.

[RPA 123 Management of forest resources](#)

0458 Dynamics and management of pest and natural resource populations

[RPA 205 Plant management and production systems](#)

0416 Molecular genetics of honeybee subspecies and selection and breeding of New World populations

[RPA 211 - Insects, mites, and other arthropods affecting plants](#)

0455 Biological diversity studies of arthropod taxa

0337 Aphids: Ecology, systematics and biocontrol

0122 A national agricultural program to clear pest control agents for minor uses

[RPA 216 Integrated pest management systems](#)

0337 Aphids: Ecology, systematics and biocontrol

[RPA 301 Reproductive performance of animals](#)

0440 Characterization of cellular proliferation in a polyembryonic parasitoid wasp

[RPA 303 Genetic Improvement of Animals](#)

0440 Characterization of cellular proliferation in a polyembryonic parasitoid wasp

RPA 304 Animal Genome

0440 Characterization of cellular proliferation in a polyembryonic parasitoid wasp

RPA 305 Animal Physiological processes

0440 Characterization of cellular proliferation in a polyembryonic parasitoid wasp

Department of Horticulture and Landscape Architecture

The objective of the Department of Horticulture and Landscape Architecture remains the same: (1) to develop and release tree fruit and small fruit varieties and cultivars that enhance the competitiveness of Washington's horticultural industries. (2) to improve efficiency of production and enhance quality of products in tree fruit and small fruit crops (3) to develop and release vegetable crop varieties and cultivars that enhance the competitiveness of Washington's horticultural industries. (4) to improve and enhance the quality of vegetable crops. Key themes in the program of Horticulture and Landscape Architecture include **plant production efficiency, plant germplasm, plant health, plant genomics, agricultural competitiveness, ornamental/green agriculture, agricultural profitability** and **agricultural competitiveness**. [RPA 212 – Diseases and nematodes affecting plants has been added to goal 1.]

RPA 102 Soil, plant, water and nutrient relationships

0377 Production Horticulture and Integrated management systems of grapes
1984 Production and environmental inputs affecting yield and quality of vegetable crops

RPA201 Plant genome, genetics and genetic mechanisms

0260 Developing new apple cultivars for Washington State
0321 Calcium/calmodulin mediated transcriptional network in plants

RPA 202 Plant genetic resources and biodiversity

0038 Breeding superior strawberry cultivars for the Pacific Northwest
0217 Cultural and cultivar studies for alternative crop production in a maritime climate
0321 Calcium/calmodulin mediated transcriptional network in plants
0640 Breeding superior raspberry cultivars for the Pacific Northwest

RPA 203 Plant biological efficiency and abiotic stresses affecting plants

0038 Breeding superior strawberry cultivars for the Pacific Northwest
0215 Freeze damage and protection of horticultural species
0258 Effect of cultural practices on plant root health and establishment of landscape plants
0285 Environmental/cultural factors on water stress resistance/growth/cold hardiness/of landscape plants
0326 Enhance market quality by improving fruit finish in apple

0346 Physiological and biochemical markers of potato seed-tuber age and their relevance to productivity
0461 Physiological and biochemical markers of potato seed-tuber age and productivity
0640 Breeding superior raspberry cultivars for the Pacific Northwest
0910 Regulating plant fertility by manipulation of flavanol levels in pollen
0937 Effects of Environmental factors on reproductive growth and development of apple

RPA 204 Plant product quality and utility (preharvest)

0038 Breeding superior strawberry cultivars for the Pacific Northwest
0298 Bioregulation of vegetative growth and fruit development in apple pear and sweet cherry
0420 Integrating whole-tree physiological, horticultural and genetic research in prunus tree fruits
0640 Breeding superior raspberry cultivars for the Pacific Northwest
0937 Effects of Environmental factors on reproductive growth and development of apple
1984 Production and environmental inputs affecting yield and quality of vegetable crops
0326 Enhance market quality by improving fruit finish in apple

RPA 205 Plant production and management systems

0044 Potato cultivar evaluation and commercial potato seed lot trials
0156 Multidisciplinary evaluation of new apple cultivars
0298 Bioregulation of vegetative growth and fruit development in apple pear and sweet cherry
0321 Calcium/calmodulin mediated transcriptional network in plants
0377 Production Horticulture and Integrated management systems of grapes
0346 Physiological and biochemical markers of potato seed-tuber age and their relevance to production
0375 Alternative cropping systems
0420 Integrating whole-tree physiological, horticultural and genetic research in prunus tree fruits
0452 Rootstock and inter-stem effects on pome and stone fruit trees
0461 Physiological and biochemical markers of potato seed-tuber age and productivity
0910 Regulating plant fertility by manipulation of flavanol levels in pollen
0937 Effects of Environmental factors on reproductive growth and development of apple

RPA 206 Basic plant biology

0321 Calcium/calmodulin mediated transcriptional network in plants
0326 Enhance market quality by improving fruit finish in apple
0346 Physiological and biochemical markers of potato seed-tuber age and their relevance to productivity

0420 Integrating whole-tree physiological, horticultural and genetic research in prunus tree fruit

0461 Physiological and biochemical markers of potato seed-tuber age and productivity

0910 Regulating plant fertility by manipulation of flavanol levels in pollen

RPA 212 Diseases and nematodes affecting plants

0038 Breeding superior strawberry cultivars for the Pacific Northwest

0424 Strategies for ecological pest management in cranberries

0640 Breeding superior raspberry cultivars for the Pacific Northwest

RPA 213 Weeds affecting plants

0424 Strategies for ecological pest management in cranberries

RPA 216 Integrated pest management systems

0044 Potato cultivar evaluation and commercial potato seed lot trials

0424 Strategies for ecological pest management in cranberries

RPA 503 Quality maintenance in storing and marketing food products

0346 Physiological and biochemical markers of potato seed-tuber age and their relevance to productivity

0461 Physiological and biochemical markers of potato seed-tuber age and productivity

0503 Postharvest physiology of fruits

RPA 601 Economics of agricultural productions and farm management

0044 Potato cultivar evaluation and commercial potato seed lot trials

RPA 702 Requirements and function of nutrients and other food components

0910 Regulating plant fertility by manipulation of flavanol levels in pollen

RPA 711 – Ensure food product free of harmful chemicals, including residues from agricultural and other sources

1984 Production and environmental inputs affecting yield and quality of vegetable crops

Department of Plant Pathology

The goals of the Department of Plant Pathology under goal 1 remain the same: the maintenance of environmentally sound agricultural production systems, environmentally friendly and effective disease control and pursuing fundamental understanding of pathogens and their interactions with plants and the environment. The key theme of the research performed in plant pathology under goal 1 is **plant health**. RPA 205 Plant production and management systems and RPA 206 basic plant biology have been added

in this Update of the POW. RPA 215 Biological control of pests affecting plant has been removed.

[RPA 205 Plant production management systems](#)

0367 Epidemiology and management of fungal and bacterial diseases of tree fruits

[RPA 206 Basic plant biology](#)

0565 Fungi of the Pacific Northwest

0572 Teleomorph-Anamorph connections in lignicolous pyrenomycetes

1767 Mycobiotic, revisionary and monographic studies in *Xylariaceae* and related families

[RPA 212 - Disease and Nematodes Affecting Plants](#)

0185 Genetic variability in the cyst and root knot nematode

0252 Diseases of Blueberry and Cranberry: Their etiology, epidemiology and control

0274 Development and implementation of direct seed cereal based cropping systems for the inland northwest

0290 Characterization and control of plant viruses and virus-like agents that infect perennial fruits

0300 Population biology of plant pathogenic fungi

0313 Systematics and biology of economically important fungi in the Pacific Northwest agriculture

0336 Integrated disease control programs for economically important vegetable crops in western Washington

0365 Integrated disease management of small seeds vegetable seed crops in Washington State

0387 Management of diseases on field and greenhouse-grown ornamental bulb crops

0388 Management of diseases on Christmas trees and the identification of Christmas trees with superior post-harvest characteristics

0409 Eradication, containment and/or management of Plum Pox (Sharka)

0423 Epidemiology and management of powdery mildew of wine grapes

0542 Management of plant-parasitic nematodes and development of rapid diagnostic tests for nematode identification in Washington State

0545 Molecular and biological approaches to studying emerging virus threats

0669 Controlling eyespot in winter wheat with disease resistance

0563 Host resistance as the cornerstone for managing plant-parasitic nematodes in sustainable agriculture

0564 Managing plant microbe interactions in soil to promote sustainable

0670 Biology and control of cephalosporium stripe in winter wheat

0678 Disease warning systems of potato and mint

0795 Etiology, epidemiology and control of powdery mildew in stone fruits

0837 Systematics and biology of phytopathogenic fungi with emphasis on Tilletiales

1262 National program for controlling virus diseases of temperate fruit tree crops

1844 Regulation of disease resistance genes in transgenic potatoes and other plants

Department of Statistics

The newly named Department of Statistics was the “Program in Statistics” at the time of the first Revision of the Plan of Work in 2001. Since the name change, two projects from the Department have been approved and we have included them in the revised Plan of Work.

Themes for statistical research do not appear on the key themes list and thus we list them as **Other: statistical design.**

RPA 901 Research design and statistics

0254 Analysis of resource selection using generalized linear models

0340 Interactive computer programs for statistics education

Institute of Biological Chemistry

The Institute of Biological Chemistry is a department devoted to the basic biochemistry and molecular biology of plants. The goals of the Institute of Biological Chemistry are: identify the mechanisms involved in heartwood formation in order to modify the properties of wood, to identify and isolate certain genes in the yew to overexpress the genes increasing taxol production, to understand the genetic and biological mechanisms of plants to improve and enhance the production and yield of various crops, examine the various metabolic responses of plants to stress, explore how photosynthesis operates in living plants, study the effects of photosynthesis on plant metabolism, elucidate the biochemical, molecular and cellular basis of plant defense proteins, study the biochemical regulation of terpenoid metabolism, develop strategies of enhancing and improving the partitioning of carbon into useful storage products, identify and enhance plants natural defense systems against pathogens and insects. Key themes of their work include: **Plant genomics and other: plant metabolism, biosynthesis, plant physiology, plant biodiversity and plant immune defense.**

RPA 125 Agroforestry and RPA 205 plant production and management systems have been added to the IBC’s programs in this Update. RPA 212 Diseases and Nematodes affecting plants has been removed.

RPA 123 Management of Forest Resources

0202 Metabolic compartmentation during (Heart)wood and seed coat development

0590 mRNA sorting in plants

RPA 125 Agroforestry

0967 Diterpene biosynthesis in taxol production and conifer defense

RPA 201 Plant genome, genetics and genetic mechanism

0253 Lipid biosynthesis in leaves and seeds

RPA 202 Plant genetic resources and biodiversity

0197 Flexibility of the light reactions of photosynthesis

RPA 203 Plant biological efficiency and abiotic stresses affecting plants

0197 Flexibility of the light reactions of photosynthesis

0253 Lipid biosynthesis in leaves and seeds

0773 Nutrient exchange and metabolism in the rhizobium-legume symbiosis

RPA 204 Plant product quality and utility (preharvest)

0202 Metabolic compartmentation during (Heart)wood and seed coat development

RPA 205 Plant production and management systems

0197 Flexibility of the light reactions of photosynthesis

RPA 206 Basic plant biology

0119 Regulation of photosynthetic processes

0253 Lipid biosynthesis in leaves and seeds

0262 Sorting of proteins to vacuoles in plant cells

0268 Biochemistry of plant terpenoids

1791 Polypeptide signaling for plant defense, growth and development

RPA 211 Insects, mites and other arthropods affecting plants

1791 Polypeptide signaling for plant defense, growth and development

Center for Precision Agricultural Systems

The goals of the Center for Precision Agricultural Systems have essentially remained the same since the first revision of the first POW. They include: development of precision agricultural systems, precision irrigation, precision application of pesticides, fertilizers and herbicides and site specific meteorology. Major themes for the Center for Precision Agriculture Systems **include precision agriculture, innovative farming techniques, GIS/GPS, agricultural competitiveness, and agricultural profitability.** RPA 307 Animal production management systems has been removed from this program and RPA 402 Engineering systems has been added.

RPA 205 Plant production and management systems

0551 Advancing precision agricultural systems through automation, sensing, control and information systems

[RPA 402 Engineering systems and equipment](#)

0551 Advancing precision agricultural systems through automation, sensing, control and information systems

[RPA 404 Instrumentation and control systems](#)

0551 Advancing precision agricultural systems through automation, sensing, control and information systems

IMPACT Center

IMPACT is a unit of the ARC centering on international marketing of Pacific Northwest products primarily to the Pacific Rim countries. Funds to support projects done by faculty arise from both state and federal sources. Research Program Areas which have had a presence in the IMPACT in the past 5 years include the following: RPA 204 Plant product quality and utility (preharvest), RPA 501 New and improved food processing technologies, RPA 503 Quality maintenance in storing and marketing food products, RPA 606 International trade and development economics, and RPA 606 International trade and development economics, RPA 607 Consumer economics, and RPA 610 Domestic policy analysis. Key themes of this Center include: **Agricultural Competitiveness, Agricultural Profitability, Adding Value to New and Old Agricultural products, food borne pathogen protection, food quality and food safety.**

Presently, the current thrusts found in IMPACT are:

[RPA712 Protect food from contamination by pathogenic microorganisms, parasites and naturally occurring toxins](#)

0541 International Marketing Program for Agricultural Commodities and Trade Center

[RPA 611 Foreign policy and programs](#)

0555 Quantitative Analyses of International Food and Commodity Markets

Wood Materials and Engineering Laboratory

Wood materials and Engineering Laboratory is a unit which is situated both in the College of Engineering and the Agricultural Research Center and is devoted to the novel uses and the study and engineering of new products from forest materials. Key themes are **adding value to new and old agricultural products and agricultural profitability.** This unit has been added to the Update of the POW and was not in the previous revision made in 2001.

[RPA 511 New and improved non-food products and processes](#)

0453 Molecular scale engineering of lignocellulosic composites

GOAL II

A SAFE AND SECURE FOOD AND FIBER SYSTEM

Department of Food Science and Human Nutrition

The goals of the Department of Food Science and Human Nutrition have not changed since the revision of 2001. These goals include: investigate new thermal and non-thermal processes to produce safe, value-added food products, investigate the attributes of grains and vegetables that change during storage or affect processing and/or the marketability of the commodities. [In the present update, this portion of the programs of FSHN which appeared under Goal I in the revision of 2001 has been moved to goal 2, where they are most appropriate.] RPA 504 Home and Commercial Food service has been removed from the revised plan under goal 2. Key themes for Food Science and Human Nutrition research under Goal 2 include **food quality, foodborne pathogen protection, and foodborne illness.**

RPA 501 New and improved food processing technologies

- 0128 management of grain quality and security for world markets
- 0288 Microbiological and chemical factors affecting the flavor and textural quality of cheddar cheese
- 0537 Factors affecting the quality of Washington wine and wine grapes
- 0560 Genetic improvement of beans (*Phaseolus vulgaris* L.) for yield, disease resistance and food value
- 0846 Enological & viticultural practices in fermentation microbiology, chemistry and quality

RPA 502 New and improved food products

- 0560 Genetic improvement of beans (*Phaseolus vulgaris* L.) for yield, disease resistance and food value

RPA 503 Quality maintenance in storing and marketing food products

- 0305 Application of spectroscopic methods to improve food quality and safety of high value aquaculture products

RPA 712 Protect food from contamination by pathogenic microorganisms, parasites and naturally occurring toxins

- 0305 Application of spectroscopic methods to improve food quality and safety of high value aquaculture products
- 0369 Evaluation of surface irrigation water as source of contamination of fruits and vegetables

Field Disease Investigative Unit

The Field Disease Investigative Unit is a part of both the Department of Veterinary Clinical Sciences in the College of Veterinary Medicine and the Agricultural Research Center in the College of Agricultural, Human and Natural Resource Sciences. The primary thrust of the unit is to define and resolve animal and zoonotic disease by the development of on-farm emerging control programs. Their mission has not changed since the revision of the POW in 2001. Major themes of this unit are **animal health, food security and foodborne pathogen protection**.

RPA 311 Animal diseases

0858 Investigation of Food Animal Disease Problems in the State of Washington

RPA 712 Protect food from contamination by pathogenic microorganisms, parasites and naturally occurring toxins

0261 Enteric diseases of swine and cattle: Prevention, control and food safety

RPA 722 Zoonotic diseases and parasites affecting humans

0858 Investigation of Food Animal Disease Problems in the State of Washington

GOAL III:

A HEALTHY WELL-NOURISHED POPULATION

Department of Food Science and Human Nutrition

The overall goals of the department under national goal 3 remain unchanged since the last revision of the POW. These goals are to: continue to study the nutrition and bioavailability of particular nutrients (conjugated linoleic acid, leptin, vitamin B-6, calcium) and to study the psychosocial and dietary factors influencing nutrient intake and consumption behavior. Key themes of the research in food sciences and human nutrition under goal 3 include **human health** and **human nutrition**. [RPA 701 Nutrient composition of food is new to this Update.]

[RPA 701 Nutrient composition of food](#)

0905 Nutrient bioavailability – A key to human nutrition

RPA 702 Requirements and function of nutrients and other food components

0286 Effect of over or under consumption on serum leptin and food regulation in lean and obese subjects

0331 Dietary Astaxanthin in inflammatory disease: A rheumatoid arthritis model in dogs and cats

0370 Nutrition in the treatment of Calcium kidney stones

- 0444 Relationship between maternal isomeric CLA and human milk isomeric CLA concentrations
- 0905 Nutrient bioavailability – A key to human nutrition

RPA 703 Nutrition education

- 0103 Dietary and psychological factors affecting self management of type 2 diabetes mellitus
- 0118 Vitamin B-6 intake, smoking and DNA damage
- 0276 Factors influencing the intake of calcium rich food among adolescents

GOAL IV:

AN AGRICULTURE SYSTEM WHICH PROTECTS NATURAL RESOURCES AND THE ENVIRONMENT

Department of Agricultural and Resource Economics

The goals of ARE under national goal 4 remain the same as in the 2001 revision: generate and disseminate economic, environmental, and social intelligence concerning the impacts of public policy and changing resource conditions on food producers and processors and to assist target agricultural and resource industries to become more effective in providing their products and services to customers. Key themes of the ARE department under goal 4 include **natural resources management and other: policies concerning water use, land use and environment quality, and marketing of seafood.** RPAs 111, 609 and 901 are new in this Update.

[RPA 111 Conservation and the efficient use of water](#)

- 0160 Agricultural water management technologies, institutions and policies affecting economic viability and environmental quality

RPA 605 Natural Resource and environmental economics

- 0539 Economics, information and institutional design for natural resources and the environment
- 0299 Fisheries management and marketing of marine and aquaculture seafood

[RPA 609 Economic theory and methods](#)

- 0539 Economics, information and institutional design for natural resources and the environment

[RPA 901 Research design and statistics](#)

- 0448 Benefits and costs of natural resource policies affecting public and private lands

Department of Biological Systems Engineering

The goals of the department under national goal 4 are the same as in 2001 and include study of irrigation water use and precision irrigation, environmental water quality and watershed modeling, agricultural systems modeling and analysis. Key themes in the projects of Biological Systems Engineering under goal 4 include **agricultural waste management, water quality, GIS/GPS, soil erosion and irrigated agriculture**. RPA 501 New and improved food processing technologies, and RPA 601 Economics of agricultural production and farm management. [The objective on Animal production systems (RPA 307) has been removed and RPAs 111, 204, and 405 added.]

Current RPAs and projects under goal four are:

[RPA 111 Conservation and efficient use of water](#)

0454 Advanced water management practices to sustain irrigated agriculture in Eastern Washington

0553 Development and Application of water and nutrient models for the analysis of agricultural systems

[RPA 112 watershed protection and management](#)

0319 Field and catchment scale hydrologic modeling using GIS and simulation models

0352 A watershed scale study on no-till farming system for reducing sediment delivery

[RPA 204 Plant product quality and utility \(preharvest\)](#)

0454 Advanced water management practices to sustain irrigated agriculture in Eastern Washington

0553 Development and Application of water and nutrient models for the analysis of agricultural systems

0352 A watershed scale study on no-till farming system for reducing sediment delivery

[RPA 403 Waste disposal, recycling and reuse](#)

0554 Enhanced anaerobic digestion for animal manure with nutrient recovery

0450 Science and engineering for a biobased economy

[RPA 405 Drainage and irrigation systems](#)

0454 Advanced water management practices to sustain irrigated agriculture in Eastern Washington

Department of Crop and Soil Sciences

Goals of the Department of Crop and Soil Sciences remain practically unchanged since the revision of the POW in 2001. The goals are to promote soil environmental resources, land management systems and urban green space, seek greater harmony between

agriculture production, land use and soil environmental stewardship to achieve a safe and secure food system and to enhance ecosystem health. RPAs 121, 131 and 404 have been removed and RPAs 211 and 212 were moved to goal 1 in the Update. RPA 112 is new. Key themes for Crop and Soil Sciences include: **agricultural waste management, biodiversity, drought prevention and mitigation, global and climate changes, land use, natural resources management, nutrient management, pesticide application, riparian management, soil erosion, soil quality, sustainable agriculture, and water quality.**

RPA 101 Appraisal of soil resources

- 0323 Remote sensing for land management
- 0598 Eolian soils, global change and Washington agriculture
- 0900 Soil survey and classification

RPA 102 Soil, plant water nutrient relationships

- 0152 Characterization of flow and transport processes in soils at different scales
- 0256 Soil conditions, crop productivity and ground water quality in some Western Washington soils
- 0267 Sorption and transport in porous media at different scales
- 0385 Sorption and transport of CS in soils
- 0410 Comparative analysis of the sustainability of farming systems
- 0422 Ecologically-based management of annual weeds in dryland grain production systems
- 0257 Developing site specific approaches for crop nutrient management in irrigated agricultural systems
- 0722 Organic amendments and cover crops in sustainable agricultural systems
- 0690 Chemistry and bioavailability of waste constituents in soils

RPA 104 Protect soil from harmful effects of natural elements

- 0256 Soil conditions, crop productivity and ground water quality in some Western Washington soils
- 0323 Remote sensing for land management
- 0267 Sorption and transport in porous media at different scales
- 0690 Chemistry and bioavailability of waste constituents in soils

RPA 111 Conservation and efficient use of water

- 0152 Characterization of flow and transport processes in soils at different scales

RPA 112 Watershed protection and management

- 0256 Soil conditions, crop productivity and ground water quality in some Western Washington soils

RPA 133 Pollution prevention and migration

- 0256 Soil conditions, crop productivity and ground water quality in some Western Washington soils
- 0308 Characteristics of calcareous sands used for turfgrass root zones

RPA 204 Plant product quality and utility (preharvest)

0690 Chemistry and bioavailability of waste constituents in soils

RPA 205 Plant production and management systems

0722 Organic amendments and cover crops in sustainable agricultural systems

0308 Characteristics of calcareous sands used for turfgrass root zones

RPA 206 Basic plant biology

0689 Forage quality and management of alfalfa and grass in the Columbia basin

RPA 213 Weeds affecting plants

0422 Ecologically-based management of annual weeds in dryland grain production systems

0406 Characterizing weed population variability for improvement of weed management decision support

RPA 216 Integrated pest management systems

0422 Ecologically-based management of annual weeds in dryland grain production systems

RPA 512 Quality maintenance in storing and marketing non-food products

0689 Forage quality and management of alfalfa and grass in the Columbia Basin

Department of Entomology

The three goals for the Department of Entomology remain the same as in the 2001 revision of the POW: integrated biological control, integrated pest management and to reduce our citizenry's dependence on broad spectrum pesticides. Under goal 4 the key themes for the work of the Department of Entomology include **integrated Pest management** and **pesticide application**. [In the present Update, RPA 123 was moved to goal 1. RPA 405, RPA 711 and RPA 901 were removed because the projects previously placed under those programs were completed. RPAs 12 and RPA 121 below are new.

[RPA 112 Watershed protection and management](#)

0327 Ecological and toxicological approaches to estimate effects of pesticides on non-target organisms

[RPA 121 Management of range resources](#)

0121 Biological control in pest management systems of plants

[RPA 125 Agroforestry](#)

0405 Potential of insect growth regulators for controlling insect pests of the Pacific Northwest

RPA 133 Pollution prevention and mitigation

- 0372 Mechanisms and mitigation of agrochemical impacts on human and environmental health
- 0470 Reducing the potential for environmental contamination by pesticides and other organic chemicals
- 0457 Understanding transport and fate of pesticide management chemicals in air: Integrated field monitoring with laboratory reactivity studies

RPA 135 Aquatic and terrestrial wildlife

- 0327 Ecological and toxicological approaches to estimate effects of pesticides on non-target organisms

RPA 211 Insects, mites and other arthropods affecting plants

- 0327 Ecological and toxicological approaches to estimate effects of pesticides on non-target organisms
- 0366 Developing an IPM infrastructure for apple orchards under mating disruption
- 0386 Secondary pests of deciduous pome fruits
- 0405 Potential of insect growth regulators for controlling insect pests of the Pacific Northwest
- 0431 Biologically intensive management of arthropod pests of pear
- 1090 Management of direct pests of apple in Washington fruit tree orchards

RPA 215 Biological control of pests affecting plants

- 0121 Biological control in pest management systems of plants
- 0349 Managing agrochemical behavior under drip irrigation systems
- 0415 Utilizing complex communities of natural enemies in biocontrol
- 0430 Enhancement of dalmation toadflax biological control in Washington
- 0431 Biologically intensive management of arthropod pests of pear
- 1090 Management of direct pests of apple in Washington fruit tree orchards

RPA 216 Integrated pest management systems

- 0327 Ecological and toxicological approaches to estimate effects of pesticides on non-target organisms
- 0381 Development of integrated management systems for high value specialty crops in Central Washington
- 0405 Potential of insect growth regulators for controlling insect pests of the Pacific Northwest
- 0431 Biologically intensive management of arthropod pests of pear
- 0543 Biology and economic management of arthropod pests of berry crops
- 1090 Management of direct pests of apple in Washington fruit tree orchards

Department of Natural Resource Sciences

Key themes under goal 4 are **biodiversity, endangered species, forest crops, forest resource management, global and climate change, land use, natural resources management and riparian management**. RPA 125 Agroforestry has been removed from the revised plan of NRS. However, goals of the department remain the same: conservation biology and ecological restoration, fundamental research into plant and animal species in both terrestrial and aquatic ecosystems, research to assess impacts of past/present disturbances on ecosystems and applied research on strategies and practices to restore proper function and biological diversity to terrestrial and aquatic ecosystems that have been degraded or impacted by human activities. Key themes under goal 4 are biodiversity, endangered species, forest crops, forest resource management, global and climate change, land use, natural resources management, **and** riparian management.

RPA 121 Management of Range Resources

0438 Restoration of native shrubs in annual grasslands of the Columbia Basin using fire and herbicides

RPA 123 Management of Forest resources

0561 Analysis of the Inland Northwest wood products industry

0307 Forested riparian buffers: species, function and management for agriculture

RPA 132 Weather and climate

0113 Effects of enhanced UV-B radiation and CO₂ levels on ecophysiology of tree species

RPA 133 Pollution prevention and mitigation

0307 Forested riparian buffers: species, function and management for agriculture

RPA 135 Aquatic and terrestrial wildlife

0411 Effects of irrigation agriculture and white-tailed deer on cougar predation of mule deer

0417 Effects of nutrition and habitat quality on declining wildlife populations

0443 Restoration ecology in the Pacific Northwest

0226 Nutritional ecology of large mammals

0441 Fish and zooplankton impacts on algae standing crops in shallow, freshwater Eastern Washington

RPA 203 Plant biological efficiency and abiotic stresses affecting plants

0307 Forested riparian buffers: species, function and management for agriculture

RPA 206 Basic Plant Biology

0441 Fish and zooplankton impacts on algae standing crops in shallow, freshwater Eastern Washington

RPA 605 Natural resource and environmental economics

0561 Analysis of the Inland Northwest wood products industry

GOAL V:

ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

Department of Agricultural and Resource Economics

Themes of the single project of the ARE Department under goal 5 are **public policy** and economic **policy analysis**.

RPA 608 Community resource and development economics

0383 Public policy and the Washington Economy: A general equilibrium approach to economic policy analysis

RPA 610 Domestic policy analysis

0383 Public policy and the Washington Economy: A general equilibrium approach to economic policy analysis

Department of Community and Rural Sociology

Goals of this department have changed since the revision of 2001 due to the loss of several faculty members. The goal of the department continues to be to develop knowledge to help individuals, families and communities participate in and guide their own change in a globalizing world. Key themes in the research performed by the Department of Community and Rural Sociology include the **impact of change on rural communities** and **community development**.

RPA 803 Sociological and technological change affecting individuals, families and communities

0127 Local dimensions of the globalization of food and agricultural marketing systems

0230 Sustaining local food systems in a globalizing environment: forces, responses, impacts

0403 Systems analyses of the relationships of agriculture and food systems to community health

0445 Population change in rural communities

0981 Social and economic change and diversity in non-metro Washington

RPA 805 Community institutions and social services

0942 How visual design and layout influences answers to self-administered paper and internet surveys

Department of Horticulture and Landscape Architecture

There is a single project for the Department of Horticulture and Landscape Architecture under goal 5 and its key theme is **well-being of inhabitants of urban and rural communities**. The goals of this project have not changed since the revision of the POW.

RPA 124 Management of forest resources

0695 The impacts of plants on people

RPA 134 Outdoor recreation

0695 The impacts of plants on people

RPA 802 Human development and family well being

0695 The impacts of plants on people

RPA 804 Human environmental issues concerning apparel textiles and residential and commercial structures

0695 The impacts of plants on people

RPA 903 Communication, education and information delivery

0695 The impacts of plants on people

Department of Natural Resource Sciences

The approach of this NRS program is to address the social and economic dimensions of natural resource and forest-based communities with a sociological perspective. Project 0396 is a new project since the revision of the POW in 2001. RPA 610 is also new program. The key theme under this goal is the **impact of change on rural communities**.

RPA 610 Domestic policy analysis

0396 Natural resource/forest based communities in the new millennium: Internal responses

RPA 803 Sociological and Technological change affecting individuals, families and communities

0396 Natural resource/forest based communities in the new millennium: Internal responses