Plan of Work

Report of Accomplishments

and Results

FY2005

University of Idaho

College of Agricultural and Life Sciences

Idaho Agricultural Experiment Station

Plan of Work for the College of Agricultural and Life Sciences (CALS), Idaho Agricultural Experiment Station (IAES), University of Idaho (UI)

Background Information:

The 2005-2006 **Plan of Work (POW) Update** outlined the planned IAES research programs aligned with the key signature program areas for the College of Agricultural and Life Sciences (CALS). Although the relative roles of various research programs affecting agriculture and related areas have not changed dramatically since submission of our 1999-2004 POW, the CALS is has conducted an internal process to prioritize programs. This process is designed to focus our resources and at the same time allows research efforts to more closely align with extension and academic programs. Our research program is categorized in the following CALS signature program areas and align with the five REE goals (detailed below): 1) Environmentally and Economically Sustainable Crop and Livestock Integrated Systems, 2) Animal, Plant and Human Disease Prevention, 3) Agricultural and Food Based Process and Product Innovation, 4) Managing Soil, Air, Water and Biological Resources, 5) Human Health, Nutrition and Food Safety, Disease Prevention, 6) Urban Environment and Small Acreage Agriculture, 7) Youth Education and Development, 8) Individual and Family Well-being, and 9) Community Development. Note below that several signature programs overlap with multiple REE goals. For consistency and for ease of comparison, this report follows the format as last year's POW annual report.

GOAL 1: AN AGRICULTURAL SYSTEM THAT IS H IGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Signature Programs:

- Environmentally and Economically Sustainable Crop and Livestock Integrated Systems
- Urban Environment and Small Acreage Agriculture
- Animal, Plant and Human Disease Prevention
- Human Health, Nutrition and Food Safety

GOAL 2: A SAFE AND SECURE FOOD AND FIBER SYSTEM

Signature Programs:

- Human Health, Nutrition and Food Safety
- Animal, Plant and Human Disease Prevention

GOAL 3: A HEALTHY, WELLNOURISHED POPULATION

Signature Programs:

- Human Health, Nutrition and Food Safety
- Animal, Plant and Human Disease Prevention

GOAL 4: GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Signature Programs:

- Environmentally and Economically Sustainable Crop and Livestock Integrated Systems
- Managing Soil, Air, Water and Biological Resources
- Youth Education and Development, Individual and Family Well-being Community Development

GOAL 5: ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMEREICANS

Signature Programs:

- Youth Education and Development, Individual and Family Well-being Community Development
- Human Health, Nutrition and Food Safety
- Urban Environment and Small Acreage Agriculture

In addition to CALS signature programs, the IAES research project portfolio is segmented into nine different "programs" or Key Theme research areas which are linked to the five National REE Goals and one or more CALS signature programs. Key Themes 1-4 are encompassed under **REE Goal 1**, Key Theme 5 is linked to **REE Goal 2**, Key Theme 6 is linked to **REE Goal 3**, Key Themes 7 and 8 are linked to **REE Goal 4**, and Key Theme 9 is linked to **REE Goal 5**. For consistency and for ease of comparison to previous progress reports, we have structured reporting according to the originally defined Key Themes.

GOAL 1: AN AGRICULTURAL SYSTEM THAT IS H IGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Program 1: Plant Germplasm, Genetic Resources and Conservation, Plant Health and Well-Being
Program 2: Animal Health and Well-Being
Program 3: Crop and Livestock Production Systems
Program 4: Farm business management, economics and marketing

GOAL 2: A SAFE AND SECURE FOOD AND FIBER SYSTEM

Program 5: Food Safety and Quality

GOAL 3: A HEALTHY, WELL NOURISHED POPULATION

IAES Program 6: Human Health and Nutrition

GOAL 4: GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

IAES Program 7: Soil, Water and Air Quality Conservation and Sustainable Agriculture Practices
IAES Program 8: Pollution control and natural resources

GOAL 5: ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

IAES Program 9: Economic Enhancement, Improved Quality of Life

Contact Person

Dr. Gregory A. Bohach, Director
Idaho Agricultural Experiment Station
College of Agricultural and Life Sciences
University of Idaho
Moscow, Idaho 83844-2337
Voice: 208-885-7173
FAX: 208-885-6654
Email: agres@uidaho.edu

IAES ANNUAL REPORT FOR FY2005

A. PLANNED PROGRAMS

REE GOAL 1: AN AGRICULTURAL PRODUCTION SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

KEY THEME 1: Plant Germplasm, Genetic Resources and Conservation, Plant Health and Well Being (IAES Program 1).

Overview and Performance Goals:

UI researchers focus on identifying and manipulating plant germplasm to improve crop plant performance and the production of seed and other plant products. It is also their goal to develop economical, biological and socially compatible crop management strategies that increase production efficiency. Research in this area is conducted in close cooperation with input from relevant commodity groups including the Idaho Wheat Commission, Idaho Wheat Commission, and others. This research is also planned and conducted with the cooperation of university researchers in Oregon and Washington as well as ARS researchers in the three- state region in accordance with our long-standing Tri-State Agreement.

Accomplishments and Impacts:

Three varieties of hard wheat were released by the IAES in 2005. **Juniper**, a hard red winter wheat was released for low-rainfall, crop-fallow production systems. It has improved resistance to dwarf bunt, adult resistance to stripe rust, and moderate resistance to snow mold. **UI Darwin**, a hard white winter wheat variety, is adapted to low-rainfall, crop-fallow production systems of the Intermountain West region. It has resistance to dwarf bunt and is high yielding, has good protein levels, and excellent milling yields. **Lochsa** is a hard red Spring wheat variety. It has a protein content of 13.9% and very good yield in Southern Idaho under irrigation and rain-fed conditions. There have been few hard whites available with high protein needed for excellent bread quality. With its superior lodging resistance and good quality characteristics; it should replace Idaho 377s and Lolo with a potential to garnish 20,000 acres planted with hard white Spring wheat. The estimated gross annual benefit to the Idaho wheat industry by adopting this variety is over $560,000.

One new potato variety was released in 2005. **Blazer Russet** is a product of the cooperative USDA/ARS, UI breeding program in Aberdeen, ID. Blazer Russet is an early to mid-season variety notable for its high yield. This variety has resistance to sugar ends and most internal and external defects, and produces light fry color. Blazer Russet is high yielding and produces a higher US No. 1 percentage than other commonly grown potatoes. This variety produced 24 cwt more per acre than Shepody in western ID. It out-produced Shepody by 96 cwt per acre in Oregon and by 15 cwt in Washington. The gross annual benefit to potato producers for replacing Shepody with Blazer Russet in the Pacific Northwest is over $5 million.

One research program, which cooperates with other investigators nationally through participation on WERA-089 (Potato Viruses Committee), focuses on management strategies to control new tuber necrotic strains on seed potatoes. Idaho has 35,000 acres planted with seed potatoes which supply growers nationally and internationally. Work by Idaho researchers has led to improved management strategies requiring increased pesticide use by 3 applications per acre at an annual cost of $840,000. Despite this increased cost, the more aggressive management strategies will reduce losses caused by these viruses by 25 cwt per acre, at $6 per cwt, with a net increase in annual gross benefit to seed producers of $4.41 million.

Results of research on biological control for Russian wheat aphid have reduced losses significantly for wheat and barley farmers. Idaho has an average of 1.2 million and 710,000 acres planted with wheat and barley, respectively. Russian wheat aphid causes an average annual loss of 5 bushels per acre on 20 percent of the acreage of both crops. Biological control methods developed by the IAES have reduced this loss by 90 percent and reduced pesticide use by one application at an estimated cost of $10.00/application. The gross annual benefit to the Idaho cereal industry is estimated at $9.5 million.

A new method was assessed to control fungus with phosphorous acid. This method was compared to the present practice of using a Ridomil-based program which is more toxic and also had begun to lose its efficacy in the late 1990's. In 2000-2001 it was estimated that 100,000 cwt of tubers were discarded due to pink rot. Phosphorous acid has reduced this substantially. Field consultants estimated that the 2005 pink rot losses were approximately 1% on average. The adoption of phosphorous acid has reduced losses due to pink rot by 10.5 million cwt per year. The gross annual benefit to potato farmers is estimated at over $52. In addition, phosphorous acid is less toxic and safer for the environment than Ridomil.

KEY THEME 2: Animal Health and Well-Being (IAES Program 2).

Overview and Performance Goals:

Research on this key theme focus on generating methods for improved animal management and the detection, control and treatment of infectious diseases of domestic animals in the Northwest and United States. Animal well-being and performance and livestock and dairy product quality and consistency are enhanced and improved for the benefit of producers and consumers. This research is conducted following significant input from key industry leaders including the Idaho Beef Council and the United Dairymen of Idaho.

Accomplishments and impacts:

Research conducted at our Research, Education, and Extension Center in Salmon, ID focuses on implementation of herd health plans and measuring their effectiveness using nursing calf respiratory disease as an indicator. Respiratory disease is reported to cost Idaho beef ranchers $16 million/year. This research indicated that containment and vaccination can significantly limit nursing calf respiratory disease. Microbiological analyses (2001-2005) showed that the prevalence of common respiratory pathogens decreased to less than 3% from 11%-19% since the initiation of the project. The

estimated gross annual benefit of this plan to Idaho beef cow-calf operators is estimated at $14.5 million.

In complementary research on dairy and beef herds, an assessment of the efficacy of a commercial *Pasteurella*/*Mannheimia* (One PMH, Intervet, Inc.) was conducted. Testing this vaccine on 60-day old beef and dairy calves resulted in a reduction in morbidity and mortality, and a significant improvement in daily weight gain (more than 10%) when compared to another commercial vaccine or no vaccination. The estimated gross annual benefit to Idaho dairy and beef producers is over $14.9 million.

Johnes Disease affects the dairy and beef industries with negative consequences for animal and possibly human health. Accurate identification of infected animals promotes fast removal from herds and helps control the disease. Researchers at the UI Caine Veterinary Center conducted a program for producers and veterinarians in Idaho, to certify them for participation in the National Johnes Disease Control program. The Center also conducted field research to identify the prevalence of this disease in dairy and beef herds in Idaho. Their results showed 10% and 2% prevalence in dairy and beef animals, respectively. Producers were informed of the status of their herds and were educated to develop a control program based on the extent of risk.

KEY THEME 3: Crop and Livestock Production Systems (IAES Program 3).

Overview and Performance Goals:

This research emphasis is to develop marketing alternatives, and product quality and consistency, to meet the consumer's demands. It is also our goal to decrease the loss of natural resources (e.g. soil and water) and agricultural inputs (e.g. chemicals) by Idaho food producers. This research is conducted in close cooperation with stakeholders in the Idaho dairy and beef industries, food processing industry, and several crop commodity commissions.

Accomplishments and Impacts:

Research in the Dept. of Animal and Veterinary Sciences assessed the efficacy of a reduced dose of gonadotropin releasing hormone on ovulation rate and timing in cattle. Application of these research findings has reduced costs by $1.5-$2/animal due to; 1) dose reduction, 2) improving milk production by 1 lb per cow, 3) improving the rate of gain in beef feedlots by 0.1 lb./animal/day, 4) reducing feed cost in beef feedlots by $8.64/animal, and 5) reducing production cost for cow-calf operators by $10/animal. Approximately 20% of the cow-calf operators, 20% of the dairy producers, and 30% of the beef feedlots have adopted this methodology and these numbers are projected to grow in the future. The combined gross annual benefit to beef feedlot operators and to cow-calf operators combined is estimated to be $11.2 million.

The effect of the peptidolytic enzyme system from *Lactobacillus helveticus* on the quality of Cheddar Cheese was analyzed by a researcher in the Food Science and Toxicology Dept. This enzyme is used successfully to produce a Cheddar-type cheese with unique non-bitter flavor. This type of cheddar cheese has a market value of $15.00 per 2 lbs. compared to $4.00 per 2 lbs. for regular cheddar cheese. Idaho produces 225 million pounds of cheddar cheese annually. It is projected that 20% of Idaho cheese will

be produced with the desirable non-bitter flavor generating an additional market value of $5.00/2 lb. and a total additional annual market value of $112 million.

IAES researchers have investigated microorganisms that can utilize lignocellulose efficiently and manipulated them genetically to produce ethanol. The bacteria identified are more efficient, and potentially safer, than presently used bacteria or yeast. The methods developed by this research are expected to reduce cost of production by 50%. At the present, an estimated 8 million gallons of ethanol are produced in Idaho from potato processing wastes at an estimated cost of $12 million. This cost can be reduced by $6 million with high potential of an expanded biofuel industry in Idaho.

Research on processing efficiency and value-added products for oilseeds has been a large research program for more than 5 years. An estimated 15,000 acres are now planted with oilseed crops in Idaho. Approximately 76 gallons of oil is produced from an acre of oilseeds. In addition, 40 kg of erucic acid is extracted and sold as an industrial product for a value added of $280/acre. The remaining 63-64 gallons are sold as oil at $1.75 per gallon or processed as biodiesel for an added value of $110/acre. An estimated 400 lb. of meal is generated and sold as a livestock protein supplement for an added value of $40/acre. The extracted toxic glucosinolates can be used as fumigants to control soil-borne diseases replacing synthetic chemicals which cost $250/acre. The value added from glucosinolate produced from an acre of oilseeds is estimated at $125/acre. Total revenue from an acre of oilseeds could be over $555 compared to the present gross farm receipt from an acre of oilseeds of $187. The increase in gross annual receipts from the production of value-added products is $389/acre with a gross annual benefit to Idaho of over $5.83 million.

Results of the IAES research program to determine maximal nitrogen application efficiency on potatoes, barley, sugarbeets and wheat has resulted in a significant increase in yield (up to 25%) and reduction (up to 50%) in nitrate leaching to groundwater. The gross annual benefit to potato farmers from increased yield alone is estimated at $36 million, while 60 million lb. less of nitrogen would leach into the groundwater. Similarly, the gross annual benefit to sugarbeet, wheat, and barley farmers in increased yield is estimated at $43 million, $21 million, and $33 million, respectively.

Research on weed management in irrigated cereals and sugarbeets showed that using a combination of chemical, mechanical, and cultural control improves yield and reduce herbicide application. Farmers using the results of this research have realized a minimum of 10% increase in yield and a reduction of 1-2 applications of herbicide use at $20/application/acre. Idaho has an estimated 200,000 acres in sugarbeets, 280,000 acres in irrigated wheat, and 495,000 acres in irrigated barley. The gross annual benefit to sugarbeet producers is estimated at $4 million and to irrigated cereal producers at $15.5 million. The total annual gross benefit to the Idaho agricultural industry is $19.5 million.

KEY THEME 4: Farm business management, economics and marketing (IAES program 4).

Overview and Performance Goals:

Results of this research provides information to policy makers and to people evaluating farm and ranch property economic values and the role of public grazing rights held by ranchers. We also strive to obtain greater knowledge of international trade as it is affected by policies and trade agreements. This goal is combined with attempts to

provide a better understanding of export practices to enhance the opportunity for Idaho and the Pacific Northwest for maintaining a strong export market for agricultural products. We also attempt to increase availability of production and market information for organic niche products, to help modest sized farms increase income potential. We develop models for price outlook for crop producers in the Pacific Northwest and provide information permitting these farmers to market products more effectively and/or reduce price risk. Crop quality and competitiveness will be increased through development of improved storage conditions. This research is conducted in association with legislators, local community officials, and with key commodity commissions.

Accomplishments and Impacts:

Economic analysis indicates that development of geothermal resources near Willow Springs, ID for electricity generation would have significant impacts on the Idaho Falls-Pocatello area. Of the 240 jobs created in Idaho, approximately 200 would be local. An estimated additional $10.2 million in earnings is expected for the region. Also, tax revenues expected can be used to reduce the tax burden of existing constituents and to support new community projects. The project would contribute $1 million in local property taxes annually to Bonneville and Bingham counties, with an estimated additional $1.9 million in indirect business taxes (property and sales taxes) being distributed throughout the state.

An integrated research program to control the soil fungus (*Pythium*) has helped onion farmers reduce loss of yield and quality. The combined results of this research has helped onion farmers reduce yield loss by 20%, increase size profile by 10%, and reduce storage loss from 20% to 3%. Idaho has 10,000 acres planted with onions and an annual production of 5.88 million cwt. Approximately 60% of the production is stored. The gross annual benefits of reducing yield and storage losses are estimated at $6,644,400 and $6,777,228, respectively.

Total Idaho economic activities attributed to sugarbeet production and processing in Idaho were analyzed. The results show gross annual sales of $1.1 billion, added value of $338 million, employment of 7,038 individuals, earnings of $213 million, and indirect business taxes of $29.7 million. The loss of sugarbeet production and processing due to changing market trends, and assuming the land will be utilized in the production of other crops, will annually reduce gross sales by $721 million, value added by $163 million, employment by 3,414 jobs, earnings by $111 million, and indirect business taxes by $12 million.

Allocated Resources to Key Theme (IAES Program 1): Plant, Germplasm, Genetic Resources and Conservation, Plant Health and Well being (KAs 102, 121, 123, 133, 201, 202, 203, 204, 205, 206, 211, 212, 123, 501, 502). Research toward this thematic focus constitutes the largest program of the IAES and includes over 40 active research projects enrolled in CRIS and approximately 18.59 Scientist Years (SY) of faculty research effort.

KA	SY	PY/TY	Amount
102	**0**	**0**	**0**
121	**0**	**0**	**13,626**
123	**0**	**0**	**42,083**
133	**0**	**0**	**0**
201	**2.88**	**3.89**	**1,787,641**
202	**.55**	**0**	**231,165**
203	**2.3**	**0**	**256,548**
204	**2.13**	**0**	**1,047,546**
205	**1.25**	**2.89**	**515,109**
206	**.67**	**0**	**72,515**
211	**2.5**	**3.86**	**1,328,495**
212	**1.9**	**.5**	**760,629**
213	**2.64**	**1.78**	**700,230**
214	**0**	**0**	**0**
501	**1.47**	**1**	**200,075**
502	**.3**	**1**	**167,276**
Total	**18.59**	**14.9**	**7,122,937**

Allocated resources to KEY THEME 2 (IAES Program 2): Animal Health and Well-Being (KAs 301, 302, 305, 306, 307, 311, 312, 313, 315). This is the third largest program area encompassing 16 active research projects and approximately 9.83 SY faculty research effort.

KA	SY	PY/TY	Amount
301	**1.91**	**0**	**539,076**
302	**1.74**	**2**	**354,846**
305	**.71**	**0**	**110,979**
307	**0**	**0**	**3,589**
311	**3.48**	**1**	**1,584,590**
312	**1.39**	**0**	**206,586**
313	**0**	**0**	**0**
315	**0**	**0**	**0**
Total	**9.83**	**3**	**3,388,249**

Allocated Resources KEY THEME 3 (IAES Program 3): Crop and Livestock Production Systems (KAs 102, 308, 404, 405, and 722). This area of research includes 3 active research projects and approximately 1.55 SY of faculty research effort.

KA	SY	PY/TY	Amount
102	**0**	**0**	**0**
308	**.75**	**1**	**158,392**
404	**.8**	**1**	**172,066**
405	**0**	**0**	**0**
722	**0**	**0**	**96**
Total	**1.55**	**2**	**330,553**

Allocated Resources KEY THEME 4 (IAES Program 4): Farm business management, economics and marketing (KAs 402, 511, 601, 602, 603, 604 and 606). Research efforts toward this key theme encompass 10 active research projects that incorporate approximately 4.42 SY of faculty research effort.

KA	SY	PY/TY	Amount
216	**0**	**0**	**27,790**
402	**0**	**0**	**1,295**
511	**.55**	**0**	**234,147**
601	**2.29**	**0**	**322,696**
602	**.7**	**0**	**76,653**
603	**0**	**0**	**0**
604	**0**	**0**	**22,107**
606	**.88**	**0**	**92,576**
Total	**4.42**	**0**	**777,264**

REE GOAL 2: A SAFE AND SECURE FOOD AND FIBER SYSTEM

KEY THEME 5: Food Safety and Quality (IAES Program 5).

Overview and Performance Goals:

This research area strives to achieve a better understanding of flavor chemistry and other properties of selected agricultural commodities. Our goal is also to obtain additional information on the occurrence, effects and mechanisms of action of toxicants and antitoxicants in food. Researchers also attempt to improve diagnostic tests for microbial pathogens in food and better educate the public on food safety issues. This research is conducted in close cooperation with food processors and relevant commodity commissions in Idaho.

Accomplishments and Impacts:

UI food science, microbiology, molecular biology and engineering researchers representing several academic departments in CALS and other colleges are housed at the Center for Advanced Biomolecular Research (CAMBR) in Post Falls, ID. Their research develops biosensors to detect pathogens introduced to our food supply accidentally or by bioterrorism. In 2005, the group reported a flexible approach to biosensor development allowing for multianalyte detection with rapid transition to new targets and biosensor detection platforms. The approach, termed bionanotransduction, uses a biological recognition molecule linked to a DNA template. A new recognition molecule/DNA template combination can be produced, tested and optimized in one week or less and be incorporated into a multiplex system following optimization. It is thus conceivable that the system could be applied to detect 12-13 new targets/year in multiplex assays. Thus far, they have used this technology to detect *Salmonella* serovar Typhimurium ($<5 \times 10^4$ cfu/ml), heat-killed *E. coli* O157 ($< 10^4$ cfu/ml), and Staphylococcal enterotoxin B (<

0.5ng/ml) singly and in mixed samples on an electrochemical biosensor array. They can also can detect small quantities of *Yersinia pestis* capsule (<0.5 ng/ml), a result that has potential application for biosecurity, in particular for detecting microbial threats to the food supply.

A protein from a *Pseudoalteromonas* strain was isolated, partially purified, and used as a repair agent in the efficient detection of food-borne pathogens. This study developed a 24 hour detection technology, compared to culture and immunological methods which may require 3 to 5 days depending on the pathogen. The new method utilizes raw materials for processing and processed food products that may contain E. coli 0157, staphylococci, *Salmonella*, or *Listeria*. At least 6.5 million and as many as 76 million cases of food borne illnesses occur in the U.S., with 325,000 hospitalizations. Estimates of the annual loss caused by food borne disease range between $6.5 and $39.4 billion per year. The results of this study, plus related studies that developed engineering models to predict destruction of pathogenic microorganisms during cooking of meat products, could significantly enhance the food safety in the U.S.

UI researchers participated in, and concluded, an international study to assess the prevalence of staphylococcal toxin production, including enterotoxins which cause food poisoning, by bacterial strains associated with dairy cattle and other animals. Although the incidence of toxin production by dairy isolates has been reported to be very low, genomic analysis of staphylococcal strains in recent years has identified many new toxin genes. Considering the importance of the dairy industry in Idaho and the U.S. it is important to continually assess the potential risk these toxins pose to contamination of dairy products for human consumption. The results showed that, of 191 isolates tested, 110 were positive for at least one of 16 toxin-encoding genes, as assessed by PCR Newly described toxin genes within the *egc* gene complex were the most frequently detected genes, whereas no isolates harbored the genes for SEA or SEE, two of the classical enterotoxins. These results indicate that toxin genes among animal isolates, including bovine isolates are much more prevalent than previously believed, and that the toxin profiles associated with dairy isolates is not static. Therefore continual vigilance is needed to protect dairy products from the threat of staphylococcal food poisoning.

Allocated Resources KEY THEME 5: Food Safety and Quality (IAES Program 5) (KAs 501, 503, 603, 702, 711, 712). This IAES Program is the only contribution to REE GOAL 2 and includes 5 active research projects and accounts for approximately 1.85 SY of faculty research effort.

KA	SY	PY/TY	Amount
501	0	0	0
503	0	0	20,336
603	.25	0	33,709
702	0	0	0
711	.2	0	768,223
712	1.4	1	1,021,557
Total	**1.85**	**1**	**1,843,835**

REE GOAL 3: A HEALTHY, WELL NOURISHED POPULATION

KEY THEME 6: Human Health and Nutrition (IAES Program 6).

Overview and Performance Goals:

Researchers addressing this key theme are focused on obtaining an increased understanding of motivators and barriers toward, as well as attitudes and knowledge about, food consumption across age, gender, and selected minority groups. Other goals are to obtain a better understanding of how natural chemicals in the diet and certain microorganisms interact with disease processes and how certain diseases can be prevented or reduced in impact.

Accomplishments and Impacts:

More than 200,000 new cases of malignant pleural effusions (MPE) are diagnosed annually in the U.S. and there is a significant need for improved therapies. Prognosis with this disease is poor; patients typically do not respond well and treatment options are limited and generally ineffective. Working with Jenomic, Inc. IAES researchers conducted the basic science portion of a clinical study assessing the efficacy of a new immunotherapy agent. The clinical trial included 14 patients with MPE associated with stage IIIb non-small cell lung cancer. In this study, the immunotherapeutic agent derived from a bacterial culture was administered intrapleurally to the patients. This resulted in resolution of the effusions and an increased mean survival of 7.9 months, compared to 2.0 months for control patients. Toxicity was minimal. The Idaho researchers analyzed the effects of this therapeutic agent on human lymphocytes and helped characterize the active components and participated as co-inventors on a provisional patent application.

Work with the microscopic green algae *Chalmydomonas*, revealed information regarding the etiology of a one form of polycystic kidney disease (PKD). UI biochemists have been studying intraflagellar transport (IFT), or movement of large protein complexes along the length of the algal cilia. They showed that one of the proteins involved in IFT in this microbe is homologous to a protein linked to the autosomal recessive form of PKD. Analysis of mice with this same mutation has shown that the primary cilia of the renal collecting were poorly formed. PKD is the most common genetic disease and affects 600,000 people in the U.S. alone. The ability to use algal IFT as a model is more rapidly providing an understanding of the molecular basis for this significant human disease.

IAES researchers, collaborating with UI material scientists, developed a mechanism for inducing uptake of nanowires into epithelial cells. This was accomplished by coating nanowires with fibronectin, an extracellular matrix protein that binds to host cell integrins. This method improved uptake by approximately 50% and can now be employed as the initial step to introduce therapeutic agents such as antibiotics or tumor-specific compounds into cells or subcellular organelles such as the nucleus.

Allocated Resources KEY THEME 6: Human Health and Nutrition (IAES Program 6). (KAs 504, 701, 702, 703 and 722). IAES Program 6 represents the IAES contribution to REE GOAL 3 and includes 8 active research projects enrolled in CRIS involving approximately 2.98 SY of research effort.

KA	SY	PY/TY	Amount
504	.23	0	60,520
701	0	0	0
702	.15	0	65,158
703	1.19	0	197,777
723	1.41	0	574,393
Total	2.98	0	887,848

REE GOAL 4: GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

KEY THEME 7: Soil, Water and Air Quality Conservation and Sustainable Agriculture Practices (IAES Program 7).

Overview and Performance Goals:

This research is aimed at reducing erosion, nutrient depletion, salination and toxification of agricultural soils coupled with increased adoption of precision soil and crop management techniques. Additional goals include efficient application and utilization of water, fertilizer, pesticides, and other crop and soil amendments for biological control of pests. IAES researchers in this program also attempt to help meet the water quantity and quality needs of different constituents on a scientific basis through sustainable practices. ***This program is aligned closely with Program 8. Since there is considerable overlap in their impacts, they will be reported together below.***

KEY THEME 8: Pollution control and natural resources (IAES Program 8).

Overview and Performance Goals:

One of the primary objectives of this program is to deal with the economic costs of soil erosion and methods to reduce erosion. Both income effects and health concerns are addressed. A second major goal is to provide a safe environment for the public. ***This program is aligned closely with Program 7. Since there is considerable overlap in their impacts, they will be reported together below.***

Accomplishments and Impacts:

Research on the efficient management and of the cropping cycle to increase yield and soil quality in no-till systems resulted in a significant reduction in soil erosion. About 2% of dryland farming in Idaho uses no-till technologies. Applying IAES results has reduced topsoil loss by 5-10 tons/acre at an estimated value of $16/ton. The gross

annual benefit of reducing topsoil loss in Idaho is estimated at over $2 million. In addition, application of the results will reduce fertilizer runoff by 70%.

IAES research on reducing barriers to adoption of micro-irrigation systems significantly reduced water use on irrigated crops. Application of the results of this research helped farmers reduce water use by an average of 1.5 acre-feet at a minimum of $20/acre for potatoes, wheat, barley, and sugarbeets. Idaho has about 400,000 irrigated acres of potatoes, 200,000 irrigated acres of sugarbeets, 495,000 irrigated acres of barley, and 540,000 irrigated acres of winter and spring wheat. The gross annual benefit to Idaho's crop producers is estimated at over $32.7.

Research on the development of methodologies to rapidly assess best management practices to reduce sediment and nutrient runoff from agriculture in Idaho has helped farmers enhance the efficiency of nitrogen and phosphorous use on irrigated crops. Application of the results of this study has reduced nitrogen use by 5 lbs/acre and phosphorous use by 3 lbs/acre. The gross annual benefit of reducing nitrogen use by 5 lbs/acre is $700,000 for potato farmers, $350,000 for sugarbeet producers, and $2.1 million for wheat producers. The total gross annual benefit is $3.15 million. Reducing phosphorous use on potatoes and sugarbeets will have a gross annual benefit of $690,000. The total annual gross benefit from reduction in nitrogen and phosphorous us is estimated at $3.78 million. Application of the results of this study will also reduce the present fertilizer runoff by 2 percent.

IAES research on waste water phosphorous removal to maintain healthy aquatic ecosystems has led to the development of a high flow treatment method to scrub phosphorous and other contaminants in discharge water to very low concentrations. The Vandal-Ion™ and three other patent pending technologies are being commercialized by Blue Water Technologies, Inc. with an initial investment of over $3 million. Municipal wastewater treatment plants, food processing companies, and aquaculture operations are in the process of adopting the technologies which remove 95% of total phosphorous and comply with new federal limits on phosphorous release.

Research on environmental management of selenium developed a new method to explore the sources, pathways, receptors and control of selenium from the phosphate industry in Idaho. Idaho has the largest phosphate reserves in the U.S. and the phosphate industry is responsible for 70% of the non-farm income in the 3 southeastern counties. The contribution of the phosphate industry to the Idaho economy totals about $750 million annually. The 1996 observation of selenium as the cause of livestock toxicity near mining operations has led to public concern about the negative impact of phosphate mining on the livestock economy. The technology developed by the research to control selenium has eliminated this concern and the conflict between agriculture and mining.

Allocated Resources KEY THEME 7 : Soil, Water and Air Quality Conservation and Sustainable Agriculture Practices (IAES Program 7) (KAs 101, 102, 104, 111, 112, 132, 133, 135, 215). IAES Program 7 contributes to REE GOAL 4 and is the IAES's second largest research program area. This program area has 21 active research projects and encompasses approximately 15.21 SY of faculty research contribution.

KA	SY	PY/TY	Amount
101	1.72	0	97,247
102	4.35	2.66	970,572
104	.73	1	177,109
111	2.66	1.03	1,291,387
112	.5	0	833,803
132	0	0	27,925
133	3.35	1	552,337
135	0	0	0
215	1.9	1.18	681,697
Total	**15.21**	**6.87**	**4,632,078**

Allocated Resources KEY THEME 8: Pollution control and natural resources (IAES Program 8) (KA 605). IAES Program 8 represents the IAES's contribution to REE Goal 4 and includes 2 research projects and approximately 1.37 SY of faculty research effort.

Allocated Resources IAES Program 8:

KA	SY	PY/TY	Amount
605	.1.37	0	170,012
Total	1.37	0	170,012

REE GOAL 5: ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

KEY THEME 9: Economic Enhancement, Improved Quality of Life (IAES Program 9)

Overview and Performance Goals:

This research program 1) strives to improve the social and economic well-being of rural communities in Idaho by providing data and information on local demographics, interactions between components of the community, and planning for economic growth of the geographic unit; 2) determines how work factors (e.g. time, support, and control) enhance or impede family performance and well-being; 3 explain the consequences of family/work interaction for family members and workplace; 4) Increases understanding of parents' feeding of infants and young children and the development characteristics of

eating skills for young children; and 5) Increases understanding of culture and the mealtime environmental factors that facilitate development of self-feeding skills. Input for developing this area of research are provided by local community leaders, school districts, legislators, and local business leaders.

Idaho's population has grown 29% since 1990, to approximately 1.3 million people. In 1990, 34% of Idahoans lived in urban settings compared to 66% in 2005. This translates to an urban population increase of more than 510,000 people. These changes have led to a large increase in land used for landscaping yards, parks, golf courses, and greenbelts. Associated with the increase in land area dedicated to managed landscapes is growth of the "green industries," involved in the production and sale of plants for home horticulture and landscape service companies. Wholesale production of Idaho nursery crops in 2003 was valued at $71 million, up from $38 million in 1996. A 1999 survey by the Idaho Nursery and Landscape Association valued all wholesale and retail sales at over $662 million. To support Idaho's burgeoning horticultural industry and needs, the UI established a Commercial and Consumer Horticulture Team, consisting of 22 faculty members with expertise and interest in horticulture. The team supports three topic areas: Master Gardener education, green industry education, and consumer education. While Master Gardener education is largely an extension effort, the green industry and consumer education programs are a partnership between extension and research. Research to support nursery and small farm operations is conducted in the following areas: 1) evaluation of fir and pine species, 2) development of superior huckleberry varieties, 3) improvement of nursery propagation techniques, 4) turfgrass variety trials, 5) development of new varieties of native wildflowers, and 6) evaluation of vegetable and small fruit varieties.

Development of superior huckleberry varieties and improvement of nursery propagation techniques are the two most important research areas to enhance the growth of the nursery industry in Idaho. The huckleberry variety development research program was reported in the 2004 IAES POW. Woody plants are a significant part of the growing nursery industry in the Pacific Northwest. The present propagation techniques cannot be used with genetic engineering to develop plants resistant to pests or environmental stress. A research program at the IAES developed a better tissue culture propagation technique for woody plants that has significantly reduced production cost. An estimated 70% of the value of nursery products is production cost. Implementation of the results of this study has reduced this cost by an average of 10%. The gross annual benefit to the Idaho nursery industry is estimated at $1.59 million.

Allocated Resources KEY THEME 9: Economic Enhancement, Improved Quality of Life (IAES Program 9) (KAs 608, 801, 802, 803, 901, 902, 903). IAES Program 9 contributes to REE GOAL 5. This program area includes 4 IAES research projects and accounts for approximately 2.85 SY of faculty research effort.

KA	SY	PY/TY	Amount
608	1.38	0	143,074
801	.1	0	8,769
802	0	0	0
803	.87	0	77,033
901	.5	0	46,551
902	0	0	20,053
903	0	0	9,748
Total	2.85	0	305,228

Summarized Personnel and Allocated Resources by Federal REE Goal

Goal	SY	PY/TY	Amount
1	**34.39**	**19.92**	**11,591,117**
2	**1.85**	**1**	**1,843,931**
3	**2.98**	**0**	**897,848**
4	**16.58**	**6.87**	**4,829,880**
5	**2.85**	**0**	**305,228**
Total	**58.65**	**27.79**	**19,468,004**

B. STAKEHOLDER INPUT PROCESS

Overview: During 2005, we did not make significant changes to our stakeholder input process and the process described below reflects our current procedures which were used during this reporting period

Process: The major stakeholder groups providing input regarding the IAES's spectrum of research activities :

- The Dean's Advisory Board was instituted in 2002. This committee is comprised of a spectrum of stakeholder representatives representing government, industry, and education in Idaho. Academic departments of CALS also have individual advisory boards (see below).
- Idaho Cooperative Extension has citizen advisory groups in 42 of Idaho's 44 counties. These committees, which are composed of a very diverse and broad mix of public interests, provide input regarding extension and research program priorities from the county perspective.

- Idaho's 17 agricultural commodity commissions and organizations provide advice specific to commodity based programs and appropriate disciplines and departments within CALS. In addition, IAES researchers provide leadership and most of the content for several major commodity schools that are presented annually in the state. The commodity schools are well attended by stakeholders from Idaho and the region. These "schools", while primarily conducted as major outreach/technology transfer events to provide the latest research results to stakeholders, also serve as major sources of stakeholder input to IAES regarding research priorities and directions. Commodity schools are annually conducted for potato, cereal, and sugarbeet industries. As an example, the University of Idaho Potato School is a three-day event that annually attracts approximately 1,400 registrants who come from Idaho, the PNW region, virtually all other states involved in potato production as well as representatives from approximately 25-30 foreign countries.
- Beyond the commodity schools mentioned above, IAES faculty organize and participate in "field days" at each of the IAES's twelve off-campus Research and Extension centers. They also conduct a number of more focused tours or workshops such as: weed identification, ecology, management and technology at several locations, potato storage research open-house, pomology program open-house and field day, and tours of the IAES's crop genetic improvement research programs for beans, potatoes, wheat, and the oilseed crops of rapeseed and mustard. Again, these stakeholder events function as educational/technology transfer events as well as opportunities for stakeholder interaction.
- The IAES research project portfolio and an abbreviated version of the POW is annually shared and discussed with representative from the executive branch of state government including the Governor's Office, the Dept. of Agriculture, and to a lesser extent, the Dept. of Environmental Quality, Dept. of Health and Welfare, and the Dept. of Commerce as well as key committees (agriculture and appropriations) and leadership of the Idaho Legislature.
- The faculty, staff, and students (both graduate and undergraduate) of CALS have a vested interest in the development of appropriate research programs of high quality that are responsive to needs of the state and region. This university stakeholder group is an important source of valuable input to the IAES and play a major role in IAES program development and delivery. In the course of performing their research, the majority of researchers in the IAES have frequent and substantive contact with stakeholders in their research programs as has been indicated above. An array of inputs regarding program directions and priorities are more informally received in this manner and are subsequently considered and often implemented.

CALS has also mandated the formation of advisory committees for each of the eight academic departments in CALS. As of 2002, all departments of CALS established advisory committees. These committees are comprised of representatives from a broad base of stakeholders sharing interest in the disciplines, programs, and strategic plans of the departments. These committees are now serving as a significant additional source of stakeholder input for the IAES and CALS. In addition, once a year in on-campus

meetings the departmental advisory committees meet with the CALS and IAES leadership as well as with the Dean's Advisory Board on program priorities and directions for the college, the experiment station and the departments.

Summary of FY 2005 activities: During this reporting period, the IAES Director, CALS Dean, or their designees met at least once with each of Idaho's commodity commission group. In general, these meetings were conducted to determine priorities for research programs funded by the commissions. However additional time was spent exchanging ideas regarding future directions of IAES research and the upcoming POW renewal. CALS administration met four times with the Deans Advisory Board and with faculty as a group in each of Idaho's four administrative regions. The Dean or his designee met with state legislative leaders Boise regarding agriculture, science and technology, environmental issues, and educational appropriations. IAES researchers held numerous field days and commodity schools across the state and several of these were attended by the IAES Director or the Dean.

C. PROGRAM REVIEW PROCESS

Overview: In FY2005, no significant changes were made to our existing process which is described below.

Existing Process: All faculty in CALS or other colleges within the UI holding a research appointment in the IAES, are required to have an active, approved research project that reflects their major research emphasis. Hatch projects are expected to address problems relevant to Idaho's agriculture with either a regional or national scope of importance. Project outlines must be reviewed internally by a minimum of two colleagues with expertise in the area of research, the investigator's Department Head and a minimum of two external experts in the area not affiliated with the UI.

Research activities of the IAES that contribute to organized multi-state projects/programs approved by CSREES are designated as Multi-state (Regional) Research Projects. In the Western Region, these multi-state projects must be reviewed by a maximum of four outside peer reviewers in addition to the overall regional multi-function committee (RCIC-see below) appointed by the Western Association of Agricultural Experiment Station Directors (WAAESD). The RCIC reviews the proposal and makes recommendation to the WAAESD and, if approved, transmits the project to CSREES.

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

General Evaluation Process: Research activities of the IAES that contribute to organized multi-state projects/programs approved by CSREES are designated as regional research projects. Regional/multi-state research supported by Section 3(c)3 of the Hatch Act is appropriate for support of research when: 1) the research focuses on a specific and important problem of concern to two or more states, and 2) the research is planned and conducted as a concerted effort in which the participating scientists are mutually

responsible for accomplishing the objectives. Multi-state regional research projects outlines in which the UI participates are subject to peer review and approval as stated in the policy manual of WAAESD or those of the other SAES regions if the multi-state project originated outside of the western region.

In the western region, multi-state regional research fund projects must be reviewed by a maximum of four outside peer reviewers in addition to the Research Coordination and Implementation Committee (RCIC) which is appointed by the WAAESD in cooperation with the Western Extension Directors and Western Academic Program Directors. RCIC reviews the proposal and makes a recommendation to the WAAESD. If the proposal is approved, the WAAESD Chair, with assistance from the WAAESD Executive Director's Office transmits the project to CSREES. The RCIC also appoints Administrative Advisors to guide and administer projects and committees.

1. UI involvement with critical issues of strategic importance: Because of the size of our institution and relatively remote location, faculty researchers at the UI have traditionally been very active in multi-state programming for a number of years. IAES provides financial support for travel and operating expenses, for faculty interested in participating in multi-state activities. During this reporting period, the IAES's multi-state regional research project portfolio involves participation of 29 IAES faculty in 25 different approved multi-state research projects. Of these, thirteen projects originated in the western region, seven in the north-central region, two in the southern region, one in the northeast region, and one national research special project. In virtually all cases, IAES faculty participation in the multi-state research program has provided benefit to the IAES and to the citizens of Idaho as well as to the multi-state project and Nation in terms of productivity and providing research capacity that otherwise would not be possible. The strategic significance of this research is indicated by their close alignment with CALS signature programs (determined in part from stakeholder input as described above) and with the national REE goals as follows:

REE Goal 1: An Agricultural Production System that is Highly Competitive in the Global Economy

- W-112: Reproductive Performance in Domestic Ruminants
- W-1188: Characterization Mass and Energy Transport at Different Scales
- NC-124: Genetic Manipulation of Sweet Corn Quality and Stress Resistance
- NC-1009: Metabolic Relationships in Supply of Nutrients for Lactating Cows
- NC-1023: Improvement of Thermal and Alternative Processes for Foods
- NC-1024: Domestic Surveillance, Diagnosis, And Therapy Of Transmissible Spongiform Encephalopathies
- W-6: Plant Genetic Research Conservation and Utilization
- NRSP-4: High Value Specialty Crop Pest Management

REE Goal 2: A Safe and Secure Food and Fiber System

- S-295: Enhancing Food Safety through Control of Food-Borne Disease Agents
- NC-136: Improvement of Thermal Alternative Processes for Foods

REE Goal 3: **A Healthy, Well Nourished Population**

- W-1122: Beneficial and Adverse Effects of Natural Bioactive Chemicals on Human Health and Safety
- W-1150: Genetic Improvement of Beans (*Phaseolus vulgaris L.*) for Yield, Pest Resistance and Food Value
- W-1181: Modifying Milk Fat Composition for Enhanced Manufacturing Qualities and Consumer Acceptability
- NC-1131: Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation.

REE Goal 4: Greater Harmony Between Agriculture and the Environment

- W-1185: Biological Control in Pest Management Systems of Plants
- W-1186: Genetic Variability in the Cyst and Root-Knot Nematodes
- W-1147: Managing Plant Microbe Interactions in Soil to Promote Sustainable Agriculture
- NC-1022: The Chemical and Physical Nature of Particulate Matter Affecting Air, Water and Soil Quality
- NC-1003: Impact Analysis and Decision Strategies for Agricultural Research
- W-1128: Reducing Barriers to Adoption of Microirrigation
- S-1000: Animal Manure and Waste Utilization, Treatment and Nuisance Avoidance for a Sustainable Agriculture

REE Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans

- NE-1011: Rural Communities, Rural Labor Markets, and Public Policy
- W-192: Rural Communities and Public Lands in the West: Impacts and Alternatives
- W-1190: Interfacing technological, economic, and institutional principles for managing inter-sector mobilization of water
- W-1167: Family and Work Identities During Times of Transitions

Currently, the IAES is spending over 29% of its Federal Hatch formula funds ($582,240) in support of multistate research projects plus $624,113 in state funds. The following figures detail the IAES resource allocation to multi-state activities:

Multi-state Summary of Resources* Allocated by Federal REE Goal

Goal	SY	PY/TY	Amount
1	**6.36**	**1**	**796,435**
2	**.45**	**0**	**41,914**
3	**.15**	**0**	**12,237**
4	**2.47**	**0**	**252,800**
5	**.98**	**0**	**102,967**
Total	**10.41**	**1**	**1,206,353**

*** Includes federal appropriation of $582,240 and state dollars of $624,113.**

2. Did the planned programs address needs of underserved/underrepresented populations?

Several of the multi-state projects directly influence these populations. Specifically, Idaho's two largest minority populations are faced with issues influencing their physical health as well as their financial well-being. For example, in Idaho, these minority populations frequently live in rural communities and in single parent households. Three research projects (NE-124, W-192, and W-167) directly address these issues.

3. Did the programs describe the expected outcomes and impacts?

Yes, all investigators participating in multi-state activities are required to describe the anticipated results of their work specifically, as well as the overall accomplishments, outcomes, and impacts of the team. During FY2005, Idaho investigators contributed significantly to the multi-state research groups they participated in. Several notable examples include:

An IAES investigator participated in the multi-state research project **NE-124, Genetic Manipulation of Sweet Corn Quality and Stress Resistance.** Sweet corn is among the top six fresh market vegetables and one of the most affordable vegetables for low income people, especially children. Further, sweet corn is a major source of fiber, minerals, vitamins, and nutraceuticals in the U.S. diet. Due to the complexity of seed-borne and soil-borne pathogens, successful sweet corn production depends on the use of effective seed protectants to prevent seed and seedling diseases. Seed treatments identified in this project have the potential to increase field stands by 80 to 100 percent, thereby ensuring high productivity and economic return to the grower, more abundant and affordable sweet corn to the consumer, rational and reduced use of pesticides with less impact on the environment and the ecosystem.

Idaho's participant in the multi-state research project **W-1122, Beneficial and Adverse Effects of Natural, Bioactive Dietary Chemicals on Human Health and Food Safety**, reported that polyphenolic chemicals found in fruits and vegetables are widely thought to promote health through the prevention and treatment of chronic diseases such as cardiovascular disease and cancer. Studies show that a number of these individual bioactive chemicals do have positive effects at some dose in some models. Many of the attributes of these chemicals is thought to be from their antioxidant capacity. However, a number of recent studies fail to show positive effects when these chemicals are given in their natural milieu of other chemicals and at doses relevant to those in the diet. In fact, some of these studies show detrimental effects. The main impact of this work is to show that good scientific data is needed to support each claim of beneficial health effects and that some caution should be exercised in viewing these natural compounds as a panacea for all cures, especially at levels in the diet.

The IAES representative to **W-6, Plant Genetic Research Conservation and Utilization** is exploring ways to more rapidly move genes from jointed goatgrass, *Aegilops cylindrical*, into wheat using genetic systems present in both species that can induce chromosome rearrangement. A second aspect of this project is the development

of a recombinant inbred line population that would be of use in developing markers for soft white winter wheat. If these two projects are successful, a new source of genes for wheat improvement would be developed reducing yield loss due to biotic and abiotic stress and new molecular makers would be identified to facilitate the development of improved wheat cultivars for producers in the Pacific Northwest.

4. Did the planned programs result in improved effectiveness or efficiency?

Yes. An IAES researcher participated in the multi-state research project **W-1185, Biological Control in Pest Management Systems of Plants**. The Idaho component of the project directly addressed issues that were prioritized by Idaho stakeholders: the development of biocontrol agents for houndstongue and Brassicaceae weeds, and the distribution of biocontrol agents (for other noxious weeds) to land managers and private landowners. During 2005, the UI, in conjunction with the Nez Perce Tribe Bio-Control Center, conducted 19 one-day technology transfer workshops in the Pacific Northwest, New Mexico and South Dakota and one two-day youth camp for state, federal, and tribal land managers, private landowners, and high school students. The workshops focused on increasing the knowledge of the public and adoption of biological based management practices for noxious weeds.

An IAES researcher, working on the multi-state research project **W-1188, Characterizing Mass and Energy Transport at Different Scales**, completed a comprehensive series of experiments to determine the effects of fluid chemistry and confinement stress on swelling potential and saturated hydraulic conductivity of clay-sand mixtures and developed a novel method to determine soil specific surface area from measuring the water content – potential relationship under dry conditions. This project increased the knowledge base for the fundamental processes governing water and chemical behaviors in soils and other porous media, thereby reducing environmental impacts of agricultural practices on shallow groundwater and surface water quality. This new knowledge will constitute fundamental principles for the next generation of scientists, and as outreach material having immediate relevance for agricultural extension professionals and assists producers in determining the optimal timing and amount of chemical, fertilizer, and irrigation applications in order to sustain high agricultural productivity and profitability that is consistent with sustainable stewardship of natural resources. .

A group of Idaho researchers participated in the multi-state project **W-192, Rural Communities and Public lands in the West: Impacts and Alternatives.** Cooperation and collaboration under this project has resulted in the sharing of expertise across state lines within the western region and development and use of similar tools and methodologies to address rangeland policy analysis issues. The development of dynamic linear programming models in 6 western states allowed for assessments dealing with the ranch-level impacts of alternative sage grouse recovery strategies and alternative cattle management strategies.

E. MULTI-STATE EXTENSION ACTIVITIES

Not applicable.

F. INTEGRATED PROGRAM ACTIVITIES

Traditionally, the IAES and CALS have placed a strong emphasis on the integration of research and extension programming. Many faculty have joint appointments in research and extension to provide the closest possible integration of these functions. By virtue of our program planning process, faculty with research and extension appointments come together to plan and implement programs based on identified needs. The IAES has 71.31 full time equivalent scientific years distributed over approximately 141 faculty members with split research and extension appointments. Additional integrated activities are derived from the stakeholder input process detailed previously. These are typically manifested in a number of "outreach"/technology events during the year that are primarily conceived, organized, and presented by IAES faculty. Many of the IAES faculty involved in these activities have joint research/extension appointments, but many have no formal extension appointment.

In 2005, researchers actively participated in regional coordinating committees (CC's), education/extension and research activities (ERA's), and development committees (DC's). These activities serve to integrate two or more functions (i.e., education, extension and research) on a particular topic where multi-state coordination of information exchange is appropriate, have expected outcomes, convey knowledge, and are peer reviewed. During this reporting period, 28 IAES investigators participated in 18 such integrated activities as summarized below.

REE Goal 1: An Agricultural Production System that is Highly Competitive in the Global Economy

- NCCC22: Small Fruit and Viticulture Research
- NCR193: Plant Health: Managing Insects and Diseases of Landscape Plants
- NECC1008: Improving sweet corn: genetics and management
- WERA027: Potato Variety Development
- WERA040: Rangeland Ecological Research and Assessment
- WERA058: Production, Transition Handling, and Reestablishment of Perennial Nursery Stock
- WERA066: Integrated Management of Russian Wheat Aphid and Other Cereal Aphids
- WERA069: Coordination of Integrated Pest Management Research and Extension/Educational Programs for the Western States & Pacific Basin Territories
- WERA077: Managing Invasive Weeds in Wheat
- WERA081: Systems to Improve End-use Quality of Wheat
- WERA089: Potato Virus Disease Control
- WERA103: Nutrient Management and Water Quality

REE Goal 2: A Safe and Secure Food and Fiber System

- NCDC201: Nanotechnology and Biosensors

REE Goal 3: **A Healthy, Well Nourished Population**

- WDC005: Obesity: Assessment, Prevention and Intervention

REE Goal 4: Greater Harmony Between Agriculture and the Environment

- NCR174: Synchrotron X-Ray Sources in Soil Science Research
- WERA055: Rangeland Resource Economics and Policy
- WERA102 : Climate Data and Analyses for Applications in Agriculture and Natural Resources
- WERA1002 : Managed Grazing Systems for the Intermountain West

REE Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans

- NCCC170: Research Advances in Agricultural Statistics

Idaho researchers contributed significantly to the integrated activities they participated in. Several significant examples include:

An IAES researcher participated in **WERA-102, Climate Data and Analyses for Applications in Agriculture and Natural Resources.** This scientist serves as the Idaho State Climatologist and provides climatological and hydrologic data to users in the state, region and nation. In the western United States, climate information comes from a variety of sources and these entities share in the flow of information, including data collection and research into the relationships among weather, climate, agriculture and natural resources. This activity fosters the development of analytical tools and preparation and dissemination of analyses and forecasts. The resulting data, information, and products are used by researchers, policymakers, public land managers, extension personnel, professional consultants, growers and ranchers, to support development of new applications, transfer the technologies and practices used in the new applications, and adoption of those applications for better decision making by end users. At the local level a project focused on the Palouse Basin Aquifer water level and its annual decline. Since urban landscape irrigation consumes a large fraction of the total annual water usage, city managers and citizens want to limit water waste. The investigator developed an urban landscape irrigation web page providing information for homeowners to calculate much water is required for urban lawn irrigation. Identifying early water conservation measures may postpone drilling of deeper wells, by reducing the amount of irrigation water used, and allow for the existing aquifer to provide water for a growing population over a longer time period than if no conservation measures were enacted.

In 2005, an IAES research participated in **WERA-058, Production, Transition Handling, and Reestablishment of Perennial Nursery Stock.** The strategic issues addressed by this research were improving survival of difficult-to-transplant native conifer species and making conifer seedlings available for transplanting in fall rather than spring. In addition, research with the large balled-and-burlapped trees has shown that

Colorado spruce trees, one of Idaho's top selling conifer species, can be heeled into a gravel bed to regenerate roots, preventing loss of plants that had broken root balls. The idea of using the gravel bed for these research projects came from other WERA-058 participants. Information gained from participation in this activity is valuable to nursery stock (landscape) producers in Idaho, one of the state's top ten agricultural industries.

The focus of **WERA-103, Nutrient Management and Water Quality**, is to address specific nutrient management questions that need to be researched and answered for the ever increasing organic crop production operations. Consequently, substantial amounts of manures, composts, and municipal and industry wastes are being used in agriculture. Nitrogen mineralization is a factor that can affect crop yield quality and water quality if not accounted for. This group is initiating projects that will address predicting mineralization rates and many new management practices have been developed for crop production that maintain current levels of economic production and still protect the environment.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)
Fiscal Year: 2005

Select One: _ Interim X Final
Institution: University of Idaho
State: Idaho

Check one: ___Multistate Extension Activities
_X_ Integrated Activities (Hatch Act Funds)
___ Integrated Activities (Smith-Lever Act Funds)

	Integrated Activities (Hatch)	Multistate Extension Activities (Smith-Lever)	Integrated Activities (Smith-Lever)
Established Target %	25%		
This FY Allocation (from 1088)	$1,994,032		
This FY Target Amount	448,508		

Title of Planned Program Activity (for further details, see attached summary)

Goal 1: *An Agricultural Production System that is Highly Competitive in the Global Economy*	296,808
Goal 2: *A Safe and Secure Food and Fiber System*	47,217
Goal 3: *A Healthy, Well Nourished Population*	22,991
Goal 4: *Greater Harmony Between Agriculture and the Environment*	123,676
Goal 5: *Enhanced Economic Opportunity and Quality of Life for Americans*	7,816
Total	$498,508
Carryover	0

Certification : I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

Gregory A Bohach

5/30/2006

Director **Date**

Form CSREES-REPT (Revised 09/04) ATTACHMENT D

Integrated Activities (Hatch Act Funds)
Brief Summaries

University of Idaho
College of Agricultural and Life Sciences
Idaho Agricultural Experiment Station

Summary of REE Goals, Knowledge Areas (KA's), IAES Programs

REE Goal 1: An Agricultural Production System that is Highly Competitive in the Global Economy

Knowledge Areas: *121, 123, 201, 202, 203, 204, 205, 206, 211, 212, 213, 216, 301, 302, 305, 307, 308, 311, 312, 315, 402, 404, 501, 511, 601, 602, 604, 606, and 722*

IAES Program 1: Plant Germplasm, Genetic Resources and Conservation, Plant Health and Well Being. *UI researchers focus on identifying and manipulating plant germplasm to improve crop plant performance and the production of seed and other plant products. It is also their goal to develop economical, biological and socially compatible crop management strategies that increase production efficiency. Research in this area is conducted in close cooperation with input from relevant commodity groups including the Idaho Wheat Commission, Idaho Wheat Commission, and others. This research is also planned and conducted with the cooperation of university researchers in Oregon and Washington as well as ARS researchers in the three- state region in accordance with our long-standing Tri-State Agreement.*

IAES Program 2: Animal Health and Well-Being. *Research on this key theme focus on generating methods for improved animal management and the detection, control and treatment of infectious diseases of domestic animals in the Northwest and United States. Animal well-being and performance and livestock and dairy product quality and consistency are enhanced and improved for the benefit of producers and consumers. This research is conducted following significant input from key industry leaders including the Idaho Beef Council and the United Dairymen of Idaho.*

IAES Program 3: Crop and Livestock Production Systems. *This research emphasis is to develop marketing alternatives, and product quality and consistency, to meet the consumer's demands. It is also our goal to decrease the loss of natural resources (e.g. soil and water) and agricultural inputs (e.g. chemicals) by Idaho food producers. This research is conducted in close cooperation with stakeholders in the Idaho dairy and beef industries, food processing industry, and several crop commodity commissions.*

IAES Program 4: Farm business management, economics and marketing. *Results of this research provides information to policy makers and to people evaluating farm and ranch property economic values and the role of public grazing rights held by ranchers. We also strive to obtain greater knowledge of international trade as it is affected by policies and trade agreements. This goal is combined with attempts to provide a better understanding of export practices to enhance the opportunity for Idaho and the Pacific Northwest for maintaining a strong export market for agricultural products. We also attempt to increase availability of production and market information for organic niche products, to help modest sized farms increase income potential. We develop models for price outlook for crop producers in the Pacific Northwest and provide information permitting these farmers to market products more effectively and/or reduce price risk. Crop quality and competitiveness will be increased through development of improved storage conditions. This research is conducted in association with legislators, local community officials, and with key commodity commissions.*

REE Goal 2: A Safe and Secure Food and Fiber System

Knowledge Areas: *503, 603, 712, and 711*

IAES Program 5: Food Safety and Quality. *This research area strives to achieve a better understanding of flavor chemistry and other properties of selected agricultural commodities. Our goal is also to obtain additional information on the occurrence, effects and mechanisms of action of toxicants and antitoxicants in food. Researchers also attempt to improve diagnostic tests for microbial pathogens in food and better educate the public on food safety issues. This research is conducted in close cooperation with food processors and relevant commodity commissions in Idaho.*

REE Goal 3: A Healthy, Well Nourished Population

Knowledge Areas: *504, 702, 703, and 723*

IAES Program 6: Human Health and Nutrition. *Researchers addressing this key theme are focused on obtaining an increased understanding of motivators and barriers toward, as well as attitudes and knowledge about, food consumption across age, gender, and selected minority groups. Other goals are to obtain a better understanding of how natural chemicals in the diet and certain microorganisms interact with disease processes and how certain diseases can be prevented or reduced in impact.*

REE Goal 4: Greater Harmony Between Agriculture and the Environment

Knowledge Areas: *101, 102, 104, 111, 112, 132, 133, 215, and 605*

IAES Program 7: Soil, Water and Air Quality Conservation and Sustainable Agriculture Practices. *One of the primary objectives of this program is to deal with the economic costs of soil erosion and methods to reduce erosion. Both income effects and health concerns are addressed. A second major goal is to provide a safe environment for the public.*

IAES Program 8: Pollution control and natural resources. *One of the primary objectives of this program is to deal with the economic costs of soil erosion and methods to reduce erosion. Both income effects and health concerns are addressed. A second major goal is to provide a safe environment for the public.*

REE Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans

Knowledge Areas: *608, 801, 803, 901, 902, and 903*

IAES Program 9: Economic Enhancement, Improved Quality of Life. *This research program 1) strives to improve the social and economic well-being of rural communities in Idaho by providing data and information on local demographics, interactions between components of the community, and planning for economic growth of the geographic unit; 2) determines how work factors (e.g. time, support, and control) enhance or impede family performance and well-being; 3 explain the consequences of family/work interaction for family members and workplace; 4) Increases understanding of parents' feeding of infants and young children and the development characteristics of eating skills for young children; and 5) Increases understanding of culture and the mealtime environmental factors that facilitate development of self-feeding skills. Input for developing this area of research are provided by local community leaders, school districts, legislators, and local business leaders.*