Plan of Work

Report of Accomplishments

and Results

FY2006

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, CALS 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

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IAES ANNUAL REPORT FOR FY2006

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, the Idaho Canola/Rapeseed 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:

Potato evaluation and improvement research at the UI is conducted in conjunction with the Tri-State (Idaho, Oregon, and Washington) Potato Variety Development Program. The Pacific Northwest (PNW) potato industry helps stabilize the US food supply and adds more than $3 billion to local economies through sales of fresh and processed products. PNW processors currently export over $1 billion annually, primarily to Pacific-rim countries. Production efficiency must improve, however, to offset increasing transportation and finishing costs, and to keep the industry competitive with ever increasing foreign imports, especially those from Canada. The single major objective of this research was to release new potato varieties of value to the PNW potato industry. Varieties recently released by the Tri-State program are now produced on over 110,000 acres with value to growers placed at approximately $150 million. Ranger Russet, released by the UI via this program, is the third most widely grown variety in the Northwest US. This impact is expected to increase. An economic analysis of the program revealed that every dollar invested in the program results in a $39 return. As improved varieties are adopted quality and production efficiency will improve, fertilizer and pesticide inputs will decrease, environmental impact will be lessened.

In 2006, the UI released and applied for PVP protection for, three new potato varieties (A93157-6LS, A9045-7, and NDA5507-3Y). A93157-6LS is a dual-purpose Russet selection, notable for its resistance to the accumulation of reducing sugars following long-term storage at 40-45°F. Its cold-sweetening resistance allows storage at colder temperatures, thereby prolonging tuber dormancy and quality for processing or fresh pack use. This is the first Russet variety released that expresses the cold-sweetening resistance trait. A93157-6LS is drought tolerant and resistant to stress-related defects.

A9045-7 is lightly Russeted variety with high yields and tuber uniformity in size and shape. Fry recovery from the field or storage is high. NDA5507-3Y is the first yellow-fleshed specialty variety to be released from our breeding program. It is a mid-season selection with light-yellow flesh and higher yield potential than Yukon Gold and better virus, foliar and tuber blight resistances. Additional research was conducted to improve germplasm quality by combining resistance to corky ringspot with long tuber shape, Russet skin, and processing quality. As part of this work, the resistance genes were mapped and molecular markers identified. The mode of inheritance of tuber glycoalkaloid content was determined within the germplasm utilized in the breeding program. Finally, sources of parental clones were identified for use in developing varieties high in vitamin C.

New wheat varieties were also developed for release this year. A soft white spring wheat cultivar, IDO642 (UI Cataldo) has end-use quality, good stripe rust resistance, and has Hessian fly resistance, increasing its range of adaptability in the state, including northern Idaho. The Hessian fly is the most significant insect pest of the wheat industry in the inland Pacific northwest, causing a reduction of yield in infested areas of at least 20%. Our screening program for Hessian fly-resistance in wheat varieties was established in response to this issue and researchers in that program work closely with breeding programs in Idaho and Washington. The existing Hessian fly colony was established at the UI in 1998 and continues to be used regularly to conduct resistance screening tests. Since its inception, the UI has been able to select for several widely grown resistant varieties from Idaho. UI Cataldo (above) is the latest resistant variety released. Our program has also led to release of four resistant varieties in Washington state releases. Surveys indicate that farmer acceptance of the benefits to growing Hessian fly resistant varieties identified by this program approaches 60%.

One goal of the UI canola/rapeseed/mustard breeding program is to offer growers in the region greater flexibility on choice of crop and cropping rotation. Many growers in the region use an imidazolinone herbicide on pea or lentil fields, which limits rotations since there is a five year plant-back restriction on either canola or mustard. The new herbicide resistant cultivars developed by this program are highly tolerant to imidazolinone carry over and will allow growers to include legumes and Brassica crops in a six year rotation with cereals. Our oriental mustard cultivar Pacific Gold has become the leading green manure crop prior to planting potatoes in Idaho and Washington. Efforts to improve green manure/biopesticidal effects of our mustard cultivars have greatly enhanced productivity in both dryland and irrigated regions.

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:

UI researchers were first to successfully conduct equine cloning. Live births of three mule foals were produced by cloning from a fetal fibroblast cell line using nuclear transfer technology. This project has made international headlines in both the scientific community and popular press with the announcement of the birth of the world's first cloned equine, the mule Idaho Gem, soon followed by the births of two more identical clones Utah Pioneer and Idaho Star. In addition to being published in top-tier scientific journals such as the prestigious Science magazine, more that 600 newspapers in United States and Canada ran articles on the cloned mules - including the New York Times, Wall Street Journal, Washington Post and Los Angeles Times. The story enjoyed extensive international coverage in Europe, Asia, and Australia as well as in Newsweek and horse and mule publications around the globe. The cloning was featured on CNN and other stations in the U.S. and Europe, including the lead piece on BBC Radio News. The animals were made readily available to the public at numerous venues. At all of the public displays, the interaction with the public has been overwhelmingly positive and rewarding. One of the highlights was participating in "Family Science Day" at the Annual Meeting of the American Association for the Advancement of Science. A reasonable overall estimation of media impressions exceeds 200 million individuals.

Scientific advances from this project included characterizing the ultrasonographic, endocrinologic and histopathologic characteristics of successful and unsuccessful (pregnancy failure) cloned equine pregnancies. This information is directly relevant to the commercial application of equine cloning, one of several new assisted reproductive techniques being developed for use in horses. Uses of equine cloning include: 1) preservation of genetics from individual animals that would otherwise not be able to reproduce such as geldings, 2) preservation of genetic material of endangered and/or exotic species such as the Mongolian Wild Horse (Przewalski's horse), which has a dwindling population of fertile animals, and 3) because of the companion animal role that horses fill for some individuals, it is likely that some horse owners will have individual animals cloned for emotional fulfillment. Although some breed associations do not currently allow the registration of cloned animals, for some equine sporting activities (dressage, show-jumping, etc.) breed registry status is irrelevant, which eliminates that regulatory impediment to the utilization of cloning technology. The potential for this technology to influence the economic impact of the equine industry is considerable (www.horsecouncil.org/statistics.htm), as demonstrated by the fact that the horse industry has a direct economic effect on the United States of $39 billion annually, and directly provides 460,000 full-time equivalent jobs.

Milk contains many fatty acids that inhibit the growth of bacteria. One project in the Animal and Veterinary Sciences Department examined the impact of fatty acids found in milk on growth of *Staphylococcus aureus*, a major causative agent of mastitis. The investigator also developed and tested mechanisms for altering milk fat composition with the goal of increasing antibacterial components. The potential to alter milk fatty acid content to reduce the risk of mastitis is of tremendous economic importance to the dairy industry and has additional implications for human health as well (See Goal 3 below;

KEY THEME 6: Human Health and Nutrition). It is estimated that this research has the potential benefit to the dairy industry and reduction of mastitis by 5% would result in a $90 million annual savings in the US alone.

E. coli O157 causes gastrointestinal infections and systemic toxemia in people exposed to beef products or other products exposed to bovine feces. The toxemia is due to Shiga toxins (Stx) which are produced by some bacteria. Stx-producing *E. coli* (STEC) are pathogenic to humans, but are carried without ill effects by cattle, the reservoir for human disease. UI research has shown that STEC have antiviral activity in ruminants, likely explaining why bovine animals carry these bacteria. They discovered that the toxin subunit acts on cells infected with bovine leukemia virus (BLV) without harming normal cells. Recently, this group extended these results to other viruses such as the bovine immunodeficiency virus (BIV). Using a sheep model, it was shown that BLV-infected sheep carrying higher numbers of STEC in their gastrointestinal tract had less viral load, fewer clinical symptoms, and gained more weight compared to sheep carrying lower numbers of STEC. This finding has a broad impact for ruminant health. For example, BLV infects cattle and other ruminants worldwide inducing a chronic disease which may progress to lymphosarcoma, the most frequent malignancy of domestic cattle. In the U.S, up to 89% of the dairy herds are seropositive for BLV. In addition to BLV-induced increase in morbidity and mortality, BLV infection may increase the risk for other infectious diseases. Symptomatic cows have greatly reduced milk and fat yields. Also, several countries will not import cattle from BLV infested areas. Thus, using Stx for therapeutic or prevention of BLV infections alone would have a substantial economic impact and improve the well-being of domestic cattle.

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:

Several UI research programs focus on use of timed artificial insemination (AI) and estrous synchronization (ES) to increase reproductive efficiency and profitability of cow-calf and dairy operations. Profitability is increased if cows and heifers conceive early in the breeding season since this achieves improved conception rates, decreases age at first calving, and heavier calves at weaning time. Specifically, it is well-documented that cows conceiving early in the breeding season produce calves that weigh more at weaning. For each additional day of age, the value of the calf increases by approximately $1.40. A calf conceived on the first day of a 30-day breeding season would be worth $42.00 more than one conceived on the last day. Breeding protocols developed by our researchers resulted in a 93% pregnancy rate during the first three weeks of the breeding

season. This represents a three-fold increase compared to conventional breeding and an improvement of at least 15% compared to other accepted AI methods. If fully implemented, these techniques represent a potential increased profit of $16.5 million annually for cow-calf producers in Idaho. This methodology is applicable to dairy producers as well. An increase of 5% in conception, which is readily achievable with the UI technology, would result in 2.5% increase in overall pregnancy rate translating into increased revenue of at least $30 per dairy cow per year, regardless of herd size. During the last 5 years and through many workshops and seminars across the state, the value of this research and the use of ES and AI has been advocated as a way to breed females in a shorter time period, improve herd genetics and assist producers in becoming more profitable in their management decisions. This information was published and made accessible to producers though publication in public press such as American Cowman and Beef magazines.

One UI project uses field and hydroponic studies to assess the effects of fertilizer phosphorus on metal deficiencies in potato crops. Although zinc (Zn) is the current focus of this project, the research also evaluate the effects of excess phosphorus (P) on manganese (Mn), copper (Cu), and iron (Fe), all of which also impact profitability of potato growers. Research during the past three years analyzed P induced Zn deficiency occurrence in potatoes. Results from hydroponics and field studies indicate that Mn exerts a complex, three-way interaction on the P-Zn relationship. Data indicates that the impact of P induced Zn deficiency affects large portions (10-40% of fields) of the over 500,000 acres of potatoes in the PNW and that mismanagement causes the average grower to suffer an economic loss of $10-$100 per acre. Presentations on these findings by the researchers have been given at state, regional, national, and international meetings presented to growers, agronomists, and scientists. Specifically, the recommendation is to couple high rates of P fertilizer with small quantities of Zn and usually Mn. Growers also learn environmental and economic risks associated with over application of P fertilizer and, as a result, reduce applications to research based recommendations. Management changes resulting from this project have been documented on over 50,000 acres to date.

The uncertainty associated with the stability of irrigation water supplies in the PNW, plus concerns about effects of irrigation production systems on environmental quality have created a need for improved technologies. UI research over the last five years has led to techniques that improve water and nutrient use efficiency in potato cropping systems. Results show that both water and N use efficiency can be improved significantly through site-specific application with center pivot systems in which water and fertilizer are applied to different areas according the specific needs of each area. The center pivot irrigation systems developed via this research improve potato yields by 4-6% and increase economic returns by $65/acre. .

The Minor Use Pesticide Program in Idaho is funded by the IAES as our state supports a $945 million minor crop industry. Data generated by this project are critical for minor crop producers to maintain the economic sustainability they need to manage pests and produce these highly valuable crops. Acquiring data on new pesticide needs is continually a high priority for the Idaho Minor Crop Committee. This committee along with County Extension Educators and specialists from Idaho and the PNW identified critical pest management needs for the 2007 field evaluation. Also, critical needs obtained from Pest Management Strategic Plans was utilized by the researcher to determine what projects should be prioritized at the national IR-4 Food Use Workshop.

The investigator participated in the 2006 Food Use Workshop and also utilized the Western Region Priority Setting Tool, for ranking Idaho's critical minor use pesticide needs for 2007. She represented information about the IR-4 program and made 291 face-to-face contacts at grower meetings and national and regional workshops. The Idaho Field Center completed 19 field trials. The Idaho State Department of Agriculture issued ten Section 18 registrations, which utilized IR-4 data.

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

Overview and Performance Goals:

Results of this research provide 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 PNW 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 PNW 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:

The PNW ranks relatively low in the use of crop insurance products. Economic research suggests that a substantial beneficial impact is realized by PNW wheat producers who include crop insurance as part of their risk management program. This study focused on an analysis of wheat production in the three agronomic zones for dryland wheat in the PNW region (dry; intermediate rainfall; and higher rainfall). Applying an optimum risk management strategy has the following impacts in regard to annual returns for a complete rotation cycle, relative to cash market sales at harvest. In the dry region the impact was $2.63 per acre where the optimum strategy is purchasing Crop Revenue Coverage (CRC) crop insurance on wheat. In the intermediate region, an impact of $2.49 per acre was observed with an optimum strategy of purchasing CRC for wheat and Multi-Peril Crop Insurance (MPCI) for barley. In the wet region, the impact was $3.49 per acre with an optimum strategy of purchasing CRC for wheat and MPCI for barley and peas.

The current emphasis on bioenergy has generated interest in biodiesel production from oilseeds such as mustard but there has been little development of high-value uses for the meal. This is unfortunate since 60 to 70% of the seed exits the crushing process as meal and its use would enhance the profitability and marketability of bioenergy and its byproducts. UI research developed a biopesticide and fertilizer from mustard meal. It is a replacement for synthetic herbicides and is being used by organic fruit and vegetable growers where few alternatives exist for weed control beyond mechanical destruction. One patent is currently pending concerning the utilization of mustard meal as a

bioherbicide based on our published work involving the chemistry of mustard meal. EPA registration of the meal as a biopesticide has been initiated. The organic market is one sector showing signs of substantial growth potential, with a reported sales increase of 20% in 2005. This is consistent with average growth rates of 20% during the 1990's and predicted growth rates for the next 5 years of 20%. Fresh fruits and vegetables, our targeted crops, made up 43% of organic sales in 2002. Estimated sales of organic products are expected to reach $21.9 billion by the year 2010. It is estimated that the oilseed meal products could be used on 10-15% of all fruit and vegetable crops, with even higher use in the PNW and California.

The US potato industry is in a period of declining domestic demand. Although the industry continually attempts to expand potato demand, competing products and market forces are a continual pressure. We constantly monitor market trends so that producers can be prepared to respond to demand changes. One positive trend is the demand for organic potatoes. Fresh produce demand has grown rapidly and analyses estimate a growth of up to 20% per year. Our research also indicates that, though currently relatively small, improved market information will increase the number of Idaho potato growers who grow an organic crop. Our analysis also indicates that Idaho organic potato plantings should increased from the 200 to 300 acres in the immediate upcoming years.

Several trade policy analyses were conducted and published. A spatial equilibrium analysis was conducted of disputes over the US imposed 27.2% tariff on softwood lumber imports from Canada. The analysis of this tariff policy by UI researchers indicated that the US lumber producers benefit by $1.9 billion annually. In contrast, US consumers must spend an additional $2.9 billion as US lumber prices increased by 16.88%. The results of this project are currently being used by lumber producers, users, and policy makers for making profitable production decisions, allocating resources, promoting sales, and developing sound marketing strategies. An apple trade policy study was conducted to assess the effects of trade barriers on the world apple market. Several countries restrict apple imports, which adversely affect US apple producers. The study, completed in 2006, estimates that impact of removing apple trade barriers will increase US apple prices by 10.8%, and supply by 8.1%, raising total revenue by $23 million. The current Doha Round global trade negotiations aim to phase out trade barriers to enhance the trade flow among exporters and importers. The results from this study are being used by U.S. trade negotiators to reduce apple import restrictions in foreign countries. In a wheat trade policy study, UI researchers assessed potential trade policy reforms on the world wheat market. The US is one of the largest exporters of wheat and restricting imports by other countries adversely impacts US wheat exports. The research showed that, if trade barriers in the global wheat market are removed, US wheat exports will rise by 19.2%, prices will rise by 14.97%, and US wheat production will increase by 4.19%. These changes will lead to higher revenues to US wheat producers by approximately $46 million. These results are also useful to US wheat producers and policy makers in their negotiations in the Doha Round related to removing wheat trade barriers in certain importing nations.

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 24.0 Scientist Years (SY) of faculty research effort.

KA	SY	PY/TY	Amount
102	0	0	0
121	0	0	0
123	1.72	0	132,916
133	0	0	0
201	3.02	3.89	1,297,832
202	1.3	1.96	407,038
203	2.55	1.25	405,598
204	2.93	1.56	544,506
205	1.45	2.49	452,699
206	.89	0	462,563
211	1.8	2.0	958,053
212	4.1	2.5	958,861
213	2.64	1.78	577,281
214	0	0	0
501	.71	.92	46,737
502	.76	1	142,097
Total	**24**	**19**	**6,386,180**

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 11.0 SY faculty research effort.

KA	SY	PY/TY	Amount
301	2.91	0	332,345
302	2.25	3	790,865
305	.71	1	148,504
307	.2	0	17,628
311	3.67	4.45	1,615,254
312	1.39	0	217,858
313	0	0	0
315	0	0	0
Total	**11**	**8**	**3,122,454**

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 1.0 SY of faculty research effort.

KA	SY	PY/TY	Amount

102	0	0	0
308	0	0	3,695
404	.7	0	70,882
405	0	0	0
722	0	0	408,422
Total	**1**	**0**	**482,998**

Allocated Resources KEY THEME 4 (IAES Program 4): Farm business management, economics and marketing (KAs 216, 402, 403, 511, 601, 602, 603, 604 and 606). Research efforts toward this key theme encompass 11 active research projects that incorporate approximately 4.52 SY of faculty research effort.

KA	SY	PY/TY	Amount
216	.1	.1	92,314
402	0	0	6,674
403	0	0	7,708
511	.55	1	471,443
601	2.29	0	278,254
602	.7	0	58,914
603	0	0	0
604	0	0	0
606	.88	0	106,477
Total	**4.52**	**1.1**	**1,021,786**

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:

Family and Consumer Science research implemented a project to reduce the risk of food borne illnesses by focusing on behavioral changes in regard to meat thermometer usage. This four year project (2002-2006) was a campaign entitled "Use a Thermometer" to assess consumer attitude about using food thermometers with meat. The campaign had three focuses: 1) Partnering with Albertson's grocery stores to place the thermometer

education rack cards (see below) in 35 Idaho stores; 2) A UI press release about the Use a Thermometer campaign; and 3) Developing a full-color, 2-sided rack card explaining that use of a food thermometer prevented overcooking and was the only way to determine that the patty had been safely cooked. The card was also translated into Spanish, printed and distributed to Extension Educators. Phone surveys to assess the impact of this project indicated that the percentage of persons who use a thermometer with thin/small meat items (ground beef patties, chicken breasts, pork chops) from 4% in 2003 to 16% in 2006.

One goal of our research program is to promote a safer food supply by developing high yielding systems with reduced or eliminated pesticides. In 2006, field trials were conducted to evaluate the effectiveness of combining LCF and rapeseed meal to improve poor performing pea fields (due to nematode infestation) in Northern Idaho. LCF is a product produced from *Laetiporus sulphureus* and has known plant growth stimulating properties when applied as a seed treatment. Rapeseed meal is a byproduct of biodiesel which has glucosinolates with biocidal activities against soil borne microorganisms. Trials evaluated top dressing of with rapeseed meal followed by direct seeding of LCF and non-LCF treated seed at 1 week intervals post application of the rapeseed meal. As expected, top-dressing with meal was phytotoxic on peas up to two week post application reducing yields from 33% to 66%. Seed treatment with LCF decreased the effect of the rapeseed meal by 12% at the 0.5 ton/acre rate after two weeks but not at the higher rapeseed meal application rates. Thus, there is a potential that LCF could be incorporated as a management tool to ameliorate toxic effects by rapeseed meal treatment.

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 2.0 SY of faculty research effort.

KA	SY	PY/TY	Amount
501	0	0	0
503	0	0	0
603	.25	0	45,966
702	0	0	0
711	.2	0	205,975
712	1.15	1.83	607,873
Total	**2**	**2**	**859,814**

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:

For the past four years, an IAES research team has participated in the Northwest Regional Center of Excellence (RCE) for Biodefense funded in part by the National Institutes of Health. The UI goal of this research is to study highly virulent microbes and develop protective vaccines. One agent, *Yersinia pestis*, the causative agent of plague, is one of the most virulent and notorious human pathogens. *Y. pestis* is also a potential agent of biological warfare and is included on the CDC Category A select agent list; these agents are recognized for their enhanced ability to cause significant disease and are regulated by public laws such as the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 and the USA Patriot Act of 2002. Presently no protective vaccine against pneumonic plague exists. Research conducted at the UI has demonstrated a novel vaccination approach for this disease using compounds capable of stimulating the toll-like receptors in combination with protective antigens from the surface of *Y. pestis*. Experiments in mice demonstrated that a single intranasal application of the vaccine followed by one boost provides rapid and 100% long term protection. This technology was selected to represent the northwest RCE at an NIH product development meeting early in 2007 and a licensing agreement is currently under negotiation.

A researcher in the Animal and Veterinary Sciences Department is interested in altering milk fat composition to increase the antibacterial components in human and animal milk. The significance for this research for the dairy industry is described under the section including KEY THEME 2: Animal Health and Well-Being. Interestingly, *Staphylococcus aureus*, like in dairy animals, is the leading cause of mastitis in humans. This researcher suggests that it would be possible to reduce mastitis by approximately 10% through alteration of milk fat composition and predicts this effect would increase the percentage of women successfully breastfeeding to 6 months to 35%. An economic return of at least $150 million in the US would be expected based upon the 2002 analysis of the economic benefits of breastfeeding from the USDA Economic Research Service. Approximately $130 million would be attributable to preventing premature deaths, and an additional $20 million associated with reduced traditional medical expenses. This figure does not represent the total savings since it does not take into account over-the-counter medications, saving from reduced long-term morbidity, reduced purchase of infant formula, and benefits to the environment from reduced use of infant formula packaging.

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 3.86 SY of research effort.

KA	SY	PY/TY	Amount
504	.23	0	36,194
701	0	0	0
702	.25	0	33,596

703	.97	0	106,765
723	2.41	0	932,055
Total	3.86	0	1,108,611

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:

Technology implemented and tested by the UI removes arsenic from drinking water to below EPA safe drinking water levels of 0.010 mg/L using a novel reactive filtration approach. The residual Fe-As byproducts are stable, non-hazardous and can be disposed in municipal landfills. The technology was validated in high dissolved solids water by the Arsenic Treatment Technology program at Sandia Laboratories. The system is also efficient at removing phosphorus from wastewater. It is installed at the City of Hayden, Idaho Wastewater Treatment plant where it has demonstrated the ability to remove total P to 0.010 mg/L at 250,000 gallons per day. The process is licensed and several patents are pending. A water treatment technology start-up company has been formed to commercialize the technology and it currently employs approximately 20 staff. Two multinational engineering firms have proposed using this technology in their next generation wastewater treatment plants. The efficient P removal opens up the possibility of pollution credit trading in highly impacted watersheds. In addition, enhanced water reuse and recycling may be possible. The Association of University Technology Managers cited this technology as one of 25 innovations that changed the world in 2006.

The Science Coalition selected this research as one of 15 examples of how Americans can benefit from their investment in university research, in their 10th anniversary report "University Research: America's Competitive Edge (2006)".

UI microbiologists elucidated the mechanisms by which root-colonizing actinomycete bacteria interact with crops to protect the plants from invasion by fungi and to promote plant growth even in the absence of pathogen pressure. Working largely with *Streptomyces lydicus* strain WYEC108, which was patented as an antifungal biocontrol agent (U.S. Patent 5,403,584) the researchers showed that it colonizes plant roots prior to fungal invasion and prevents fungal colonization by occupying the same niche that the fungus prefers, while also producing multiple antifungal antibiotics. The organism also promotes plant growth by helping to assimilate inorganic nutrients, particularly iron, from the soil by producing siderophores. Several crops were affected, in particular legumes (peas, soybeans). Furthermore, perennial crops such as Kentucky bluegrass can benefit from this treatment. In addition to the direct economic benefits from reduced pesticide use, this technology has additional benefits of reducing the need to burn fields, thereby promoting public health, environmental quality, and public perception of the grass seed industry. This research was instrumental in WYEC108 commercialization as an EPA-registered biological fungicide and plant growth promoting rhizobactium.

An irrigation study assessing several crops, fertility, and varieties found that perennial rye is superior in appearance to either Kentucky bluegrass or turf-type tall fescue under water stress. Adequate N fertility improves plant vigor and produces better grass appearance under drought stress or recovery from drought-induced dormancy. A savings in water use by 40% to 69% can be achieved on a properly fertilized perennial rye lawn relative to Kentucky bluegrass. Drip tape buried 4-6 inches deep and 16 inches apart is recommended to adequately water turf, giving a uniform appearance with no wind drift or evaporation losses. No root intrusion problems are observed so buried drip irrigation may be a viable water saving alternative to sprinklers. Proper irrigation water management can also maximize corn yield and quality for the amount of water applied. Using drip tape can achieve a water savings of 10% to 30% relative to sprinkler use and up to 50% water savings relative to surface irrigation can be achieved with equal or improved crop yield and quality.

UI research has evaluated the relationship between soil N and P and the yield of 16 different northern Idaho crops under reduced tillage conditions. In addition to the developing revised fertilizer recommendations, the researchers established best management practices to protect ground water from N fertilizer applications and surface waters from non-optimum P and/or N applications. The major impact is that data on reduced runoff from reduced tillage fields enable fertilizer recommendations that produce yields comparable to traditional conventional tillage. In many cases N and P fertilizer recommendations are lower under reduced tillage conditions compared to traditional conventional production practices. Updating of 16 fertilizer guides for northern Idaho crops will reduce both N and P fertilizer applications. These recommendations have been incorporated into the USDA-NRCS nutrient management plans being developed through the northern half of Idaho. Overall, this newly established nutrient management system will reduce N and P introductions into surface waters by 20 and 24%, respectively.

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 14.0 SY of faculty research contribution.

KA	SY	PY/TY	Amount
101	0	0	8,586
102	4.35	2.66	717,487
104	.73	1	100,405
111	1.99	2.03	549,918
112	.5	.5	146,485
132	1.46	0	121,968
133	2.33	.53	515,231
135	0	0	0
215	2.6	3.04	636,458
Total	**14**	**10**	**2,796,538**

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	147,556
Total	**1.37**	**0**	**147,556**

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.

Accomplishments and Impacts:

In many cases, policymakers in the state legislature and in Idaho communities are not well prepared to address issues of economic development and lack the understanding, tools, and lack resources to make informed decisions. Idaho's CREP (Conservation Reserve Enhanced Program) alone is expected to cost the state and federal government approximately 1/3 billion dollars to obtain more water for environmental purposes. Population growth in the Boise Valley will continue to strain water resources. Several new multi-million new dams have been proposed in Idaho and the benefit and cost have yet to be examined. These issues most significantly impact the economies of rural Idaho where economic development is most critical. To address this need, research in the UI Agricultural Economics and Rural Sociology Department focuses on creating input/output and other quantitative models to evaluate economic relationships and develop planning tools for policy makers. In the past year, research was completed on: (1) water related issues and policy in Idaho relating to water allocation and recreational values; (2) recreation economics, snowmobile recreation and sport fishing in Idaho; (3) Idaho's grape and wine industry to estimate costs of production and to promote the grape industry and wine tourism in southwestern Idaho; (4) other water use policies; and (5) constructing and using impact models for several Idaho counties. A variety of issues have been analyzed with the models; timber and recreation trade-offs, industry loss, recreation impacts etc. These agricultural impact studies have helped frame the discussion for state policy regarding agriculture, as evidenced by invitations to the researchers to provide testimony to the state legislature. This research is now being used to formulate policy on key Idaho issues regarding water allocation and agricultural development. The research has been cited by state policy makers in the current water legal and political water disputes. The grape and wine research has documented that Southwestern Idaho has the potential to become a nationally recognized grape-growing region and thus promoted wine tourism and aided availability of promotion funding.

The potential to develop a sustainable bioenergy industry in several Idaho communities is strongly supported by the UI biofuels program which has been in existence since 1979. The main emphasis of this program is developing technology to convert vegetable oils to biodiesel. Our program is well known for introducing biodiesel into the national park system. Starting with Yellowstone National Park, which used biodiesel produced and supplied by the UI, the fuel is now used by virtually every park in the national park system, some of which also make it available to the general public. The UI program routinely gives presentations and provided materials to state legislators to inform them on biodiesel policy issues; presentations concerning biodiesel legislative initiatives were given to both the Senate and House agriculture committees during the past legislative session. The UI program has sought to encourage and provide technical assistance to private-sector biodiesel plant development efforts in the state. One of the original partners of Blue Sky Biodiesel, the only commercial-scale producer in the state with 10 million gallons per year of capacity, was a student who learned about biodiesel in our program. Our researchers routinely visit the plant to provide technical advice to the company on issues relating to production, quality control, and marketing. They are in

active consultation with groups in other communities including Fort Hall, Rupert, Glenns Ferry, Lewiston, and Post Falls about potential biodiesel facilities in their areas. Biodiesel plants typically require 1 to 2 employees per million gallons of annual production so a 50 million gallon/year industry, which is quite feasible in 2-3 years, would add 50 to 100 new jobs to the state.

In 2006 two programs, "Diabetes Pedometer" (DP) and "Steps To A New You" (STNY) program were tested and evaluated. The DP program increases individuals consuming fat-free or skim dairy products (from 37.5% to 43%), as well as in the amounts of meat (from 3.8 oz/d to 5.0 oz/d) and cheese (from 0.625 oz/d to 0.92 oz/d) consumed. Very small changes in total grain, fruit, and vegetable consumption were also observed. Participants in this program also increased the number of times per week that in which they accumulated 30 minutes of physical activity daily (from 3.8 to 4.3 days /week) and had a reduced body mass index (BMI) (from 32.05 to 31). Participants in the STNY program had improved eating habits. Use of low-fat dairy products doubled (from 22% to 43%), fruit and milk consumption increased from 1.2 to 1.7 and from 1.6 to 2.3 cups per day, respectively. Although there was an increase in the number of participants who drank soda at least once daily, the increase was in diet soda consumption with a significant decrease in sweetened drink consumption. There was an increase in the number of participants who, enjoyed physical activity (37 to 86%), added physical activity to their daily routine ≥4 times per day (3 to 29%), did strength training (6 to 57%), low-intensity(34 to 57%), moderate-intensity(34 to 71%) and high intensity(15 to 57%) exercises. There was an increase in the percentage of people who were happy with whom they are (from 13 to 43%) and a decrease in the percentage of people who were very dissatisfied with their weight (47% to 0%) and shape (38% to 0%). BMI remained virtually unchanged from week 1 to week 9 (36.4 and 36.5), and decreased slightly to 35.8 at week 22. The mean resting heart rate decreased slightly from 78.8 at week 1 to 76.0 at week 9, but dropped to 71.5 at week 22.

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 3.0 SY of faculty research effort.

KA	SY	PY/TY	Amount
608	1.38	0	118,611
801	.1	0	6,810
802	0	0	0
803	.53	0	118,171
901	.86	0	152,118
902	0	0	18,889
903	.25	0	22,478
Total	**3**	**0**	**437,078**

Summarized Personnel and Allocated Resources by Federal REE Goal

Goal	SY	PY/TY	Amount
1	40.12	28.8	10,512,355
2	1.6	1.83	1,268,236
3	3.86	0	1,108,611
4	15.43	9.86	3,036,735
5	3.12	0	437,078
Total	64	40	16,363,014

B. STAKEHOLDER INPUT PROCESS

Overview: During 2006, 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 UI 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 2006 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. The major research related accomplishments of these interactions in 2006 include:

1. Legislative approval and $10 million funding for a livestock research and education facility in south central Idaho. This approval culminated more than two years of planning and cooperation with Idaho livestock industries, state and

federal legislators, Idaho State Department of Agriculture, the Governor's office and the Dean's Advisory Board.

2. Expansion of the Idaho Canola and Rapeseed Commission (ICRC) to include all oilseed crops. This was the result of interactions of the UI Biodiesel group with the ICRC and their interest in expanding uses for all oilseed crops grown in Idaho. This should benefit growers as well as generate additional funds for biofuels research.
3. Expansion of the mission of the Sandpoint Research and Extension Center. The UI has completed collaborative planning with a private entity in Sandpoint, the local community, and key stakeholders to expand the mission of this center. Discussions in 2006 led to cooperation between CALS, the UI, and the city of Sandpoint to build an educational and research complex on this site and on additional donated land. This will greatly expand our capabilities in several of the key themes covered by this report.

C. PROGRAM REVIEW PROCESS

Overview: In FY2006, 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 23 IAES faculty in 20 different approved multi-state research projects. Of these, thirteen projects originated in the western region, five in the north-central region, one 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-1150: Genetic Improvement of Beans (*Phaseolus vulgaris L.*) for Yield, Pest Resistance and Food Value
- W-1188: Characterization Mass and Energy Transport at Different Scales
- NC-1009: Metabolic Relationships in Supply of Nutrients for Lactating Cows
- NC-1024: Domestic Surveillance, Diagnosis, And Therapy Of Transmissible Spongiform Encephalopathies
- W-6: Plant Genetic Research Conservation and Utilization

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

- NRSP-4: High Value Specialty Crop Pest Management

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

- W-1122: Beneficial and Adverse Effects of Natural Bioactive Chemicals on Human Health and Safety

- 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

Currently, the IAES is spending over 29% of its total Federal hatch formula funds ($572,934) in support of multistate research projects plus $749,734 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	**7.06**	**6.62**	**923,358**
2	**.2**	**0**	**18,474**
3	**.25**	**0**	**33,596**
4	**2.47**	**0**	**247,165**
5	**.98**	**0**	**99,931**
Total	**10.96**	**6.62**	**1,321,974**

*** Includes federal appropriation of $572,240 and state dollars of $749,734.**

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

Yes, several of the multi-state projects directly and indirectly 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. W-192 (Rural Communities and Public Lands in the West: Impacts and

Alternatives) and NE-1011 (Rural Communities, Rural Labor Markets, and Public Policy) directly relate to 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 FY2006, 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 **NC-1131, Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation**. This project focuses on meeting consumer needs for a high quality product while maintaining profitability of production, decreasing environmental impacts, and minimizing use of natural resources through improvements in the efficiency of meat production. Advancing this project relies directly on fundamental knowledge of the biological mechanisms that regulate growth. Idaho's participant has contributed to furthering this science by characterization of the developmental expression of two insulin's in zebra fish. This study provided fundamental knowledge about the developmental roles of insulin and a basis upon which to build understanding of the regulation of the insulin axis. In the longer term, understanding regulation of insulin in development has the potential to provide a basis for selection or manipulation to improve growth. In addition, understanding the regulation of energy metabolism in teleosts will also provide a basis for selection or manipulation to improve growth efficiency through optimizing diets resulting in superior growth and lean deposition of fish in aquaculture.

Idaho participates in the multi-state research project **W-1147, Managing Plant Microbe Interactions in Soil to Promote Sustainable Agriculture**. The future of sustainable agriculture in the U.S. will increasingly rely on the integration of biotechnology with traditional agricultural practices. Although genetic engineering promises enhanced yields and disease resistance, it is also important to recognize that plants exist in intimate associations with microorganisms, some of which cause plant disease while others protect against disease. Identifying, understanding and utilizing microorganisms or microbial products to control plant disease and enhance crop production are integral parts of sustainable agriculture. Biological control has the potential to control crop diseases while causing no or minimal detrimental environmental impact. There is a strong movement for biofuel production from rapeseed in the PNW. This will be critical in addressing energy needs without bearing the burden of higher fossil fuel costs. However, biofuels create additional biomass that may contribute to waste stream management problems. Creative means for rapeseed meal utilization or disposal will directly impact agriculture. Rapeseed meal is a source of additional nitrogen which will decrease dependency on fossil-fuel derived fertilizers. The meal is also a source of glucosinolates which would directly affect soil populations of microorganisms. In the PNW, there is suggestive evidence that nematodes may be a greater production limitation to pea production than has been recognized. Data suggest that LCF, a product from *Laetiporus sulphureus*, can be used to stimulate plant growth that will enable peas to more efficiently utilize the

added nitrogen from the meal while decreasing the phytotoxic effects imparted by the rapeseed meal. This would have a direct benefit of addressing the narrow planting windows inherent in PNW farming without increasing inputs while deriving the benefit of and providing a biological alternative from managing rapeseed meal waste products from biofuel production.

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

Yes. An IAES researcher participated in the multi-state research project **NC1022, The Chemical and Physical Nature of Particulate Matter Affecting Air, Water, and Soil Quality**. Effective management of the environment requires a process-level understanding of biological, chemical, and physical reactions between solid, solution, and gas phases. To achieve this process-level understanding requires experiments that investigate biogeochemical reactions at the molecular scale. Synchrotron radiation is perhaps one of the most powerful tools available to probe systems at the molecular scale. This multi-state project brings together researchers from several different disciplines to collaborate on using synchrotron radiation sources. Because the air-water-soil interface is where most organisms live, it is critical that to be able to effectively predict and manage the biogeochemical processes occurring in this interfacial region to preserve and improve the quality of life. Activities of this multi-state research group allow for planning and sharing of methods for using synchrotrons on natural systems and facilitates cross disciplinary interaction. Specifically in Idaho, new information on speciation of Pb, Zn, Fe, As, Se, and Cd in soils was collected from Coeur d'Alene, Idaho and the Western Phosphate Resource Area (WPRA) in South East Idaho and analyzed using Synchroton tools. For ecosystem and community health, speciation of contaminants in these environments must be known and will lead to improved risk management and remediation efforts.

An Idaho researcher, participating in the multi-state research project **W-1128, Reducing Barriers to Adoption of Microirrigation,** worked with USDA-NRCS to design a pressurized irrigation system for a 26-homeowner subdivision south of Twin Falls, Idaho. Many rural subdivisions with lot size of 1-5 acres in this area use groundwater to irrigate lawns and horse pastures even though surface water. In some cases, even though surface water is available, lots are upslope from the supply so residents must either pump surface water or groundwater. Soil moisture monitors were installed at several sites to document current irrigation practices and improve future water management. This project showed the difficulties of retrofitting an existing subdivision to pressurized water, and why it is essential in new subdivision plans to include pressurized water irrigation system as part of the initial subdivision infrastructure. The project also showed the type of equipment that should be used in and irrigation water management strategies for assuring desired lawn, garden and pasture production. By converting to a central pressurized irrigation system, eight homeowners were able to stop irrigating lawns and pastures with domestic well water. Conversion of 10 acres of lawn and pasture to pressurized surface water instead of groundwater reduced groundwater pumping in this small regional aquifer by 10 million gallons per year. A video was developed chronicling project successes and difficulties for education of planning and zoning and other governmental units.

An Idaho researcher participated in **NC-1009, Relationships in Supply of Nutrients for Lactating Cows.** The long-term goal of the multi-state project is to improve the efficiency of milk production and thus promote environmental and economic sustainability in the US dairy industry. The approach to achieve this goal is to challenge and refine computer-based nutrition systems that will predict the relationship between feed inputs and milk outputs of cattle. To assess the accuracy of these systems, collect adequate quantitative data regarding the absorbed nutrients provided by different diets and the metabolic responses of cows to those nutrients and to regulatory molecules. The research group is comprised of preeminent dairy scientists in the US with a broad base of specialties that encompass feed analysis; feeding management; ruminal microbial metabolism; intestinal digestion; physiology and metabolism of splanchnic, adipose, muscle, and mammary tissues; molecular and cellular biology; mathematical modeling; and the role of nutrition in health and nutrient partitioning. Project specific objectives are to quantify properties of feeds that determine the availability of nutrients critical to milk production; quantify metabolic interactions among nutrients that alter synthesis of milk; and use these quantitative relationships to challenge and refine computer-based nutrition systems for dairy cattle. The main objective of Idaho's contributing project in this effort was to evaluate the feasibility of using isotopic techniques in estimating ammonia losses from manure and to develop and populate a comprehensive prediction model of ammonia losses from dairy manure. Diet, fecal, urine, and manure samples were collected from dairies in the Pacific Northwest and analyzed for chemical and isotopic composition and for ammonia volatilization rates in vitro (ID). Cumulative ammonia loss was estimated based on daily emissions and daily manure and ammonia samples were analyzed for 15N abundance. Correlations between cumulative ammonia losses and 15N abundance of manure N ranged from $r = 0.70$ to $r = 0.92$ and the relationship was linear. This study demonstrated that 15N abundance of the ammonia emitted from cattle manure during storage is relatively constant and delta 15N of aged manure could potentially be used to predict ammonia emissions from cattle manure.

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. 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 75.15 full time equivalent scientific years distributed over approximately 140 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 2006, 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, 24 IAES investigators participated in 17 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
- 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
- WERA097: Diseases of Cereals
- WERA103: Nutrient Management and Water Quality
- SCC80: Plant Breeding

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

- 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. In 2006, multiple IAES researcher participated in **WERA089, Potato Virus Disease Control**. This group provides a regional forum for the exchange of ideas and the means and opportunity for cooperation and collaboration among those involved in potato virus disease research for the long term goal of improving plant health and crop sustainability. In addition, WERA-089 assists participants in the identification, transfer and utilization of knowledge, methods and resources, and disseminates information to concerned parties for implementation of potato virus disease control strategies. Also, this group acts in an advisory capacity with regional and national organizations for the purpose of evaluating concerns, recommending policies and reviewing quarantine and seed certification issues and other pertinent matter as they relate to potato viruses and their control.

To provide clean, virus-free potato seed for potato growers, Idaho maintains an active *in vitro* micro-propagation program. A key element of this program is multiple, successive testing of potato plantlets after chemical and heat treatments to confirm virus-free status of a particular line. Currently, the bulk of testing is done by enzyme-linked immunosorbent assay (ELISA), a good sensitive method which is widely and successfully used in Idaho potato seed production. Nevertheless, testing immature or juvenile tissue, characteristic of *in vitro* plantlets, presents a significant challenge, and requires a transfer into a growth chamber and long waiting time prior to the testing. In order to shorten the testing time, and speed up the overall production of virus-free lines, we evaluated the efficiency of a polymerase chain-reaction (PCR) based testing for *in vitro* propagated potato lines from the Idaho potato tissue culture collection. PVY, PVA, PVX, PVM, PVS, and PLRV were detected in *in vitro* potato cuttings individually, or in a multiplex format which allows testing of up to 96 lines on a single plate. The data obtained suggest that the RT-PCR based detection of several major potato viruses may significantly speed up and improve production of virus-free potato lines.

The early detection and management of viruses causing tuber necrosis in potato is critical. Necrotic damage of the tuber is one of the major factors causing losses for commercial potato producers: it reduces value of potato for processing. Viruses, causing these tuber syndromes may be symptomless in the foliage during winter testing, and thus present considerable challenge for early detection and management. The recent spread of PVY-NTN strains in North America, and new finds of other viruses causing similar tuber syndromes, e.g. TRV, PMTV, and PLRV highlight the importance of this problem. A new multiplex RT-PCR test was developed in Idaho to quickly type PVY strains and identify undesirable NTN isolates. This new multiplex test is being used in a joint U.S.-Canada survey of PVY strains in seed potato production. The test has allowed quick identification of problematic areas and facilitated the clean-up of NTN-infested seed lots. The same multiplex test is being used for improved production of virus-free nuclear potato lines.

NCCC-22, Small Fruit and Viticulture Research (Multistate Research Coordinating Committee and Information Exchange Group) focuses on table and wine grapes and small fruits, including strawberries, blueberries, table grapes, blackberries, raspberries, cranberries, and currants, high value horticultural crops used in both fresh and processed fruit markets. In addition, grower profitability can still be

realized with small plantings and relatively small investment inputs, thus making small fruits a suitable venture for many small farms. Despite high profitability and considerable grower interest, acreage in most states is limited. Due to the wide dispersal of researchers, it is critical that a venue be provided to allow small fruit horticulturists to coordinate and collaborate. This group collaborate across states to: 1) evaluate and exchange germplasm in a systematic way; 2) develop protocols for testing and evaluating new selections; 3) determine how widely adapted are new selections and cultivars; 4) determine if new selections and cultivars are resistant to pests across a representative host range; 5) develop joint proposals for field trials; and 6) share research plans to avoid duplication and inefficient use of resources. The interaction of researchers in NCCC-22 enables exchange of up-to-date information on the latest research trends as well as problems encountered in regions and states.

The UI is the leader in developing western huckleberries and bilberries as managed crops for commercial production of fruits and foliage and has a well-established cultivar development program producing 97 early or advanced selections, with 13 selections ready for cooperator testing. Plants will be distributed beginning in the spring of 2007 for testing in Idaho, Oregon, and Washington.

In addition, grape production continues to expand in Idaho. Efforts at the UI have encouraged the planting of approximately 600 acres of table grapes, primarily in the fruit-growing region of southwestern Idaho. Lewiston and other locations in the low-elevation Clearwater River drainage are also well suited to table grape and hybrid wine grape production. Wine grape production in southwestern Idaho also showed increases in acreage since 1993, totaling approximately 1,200 acres in 2006. Most of Idaho wine grape vineyards are located in the Western Snake River Plain (WSRP) rift basin (~43°N, ~114°W) on soils derived from lake, river, volcanic and wind-blown sediments. The arid to semi-arid, mid-latitude steppe climate of the WSRP provides fewer growing degree days than American Viticultural Areas (AVAs) in Walla Walla, Washington and Napa Valley, California, but still allows cultivation of *Vitis vinifera* grapes. Other differences in the WSRP include lower precipitation, higher solar radiation during the growing season, and greater threat of cold injury. Wine grapes grown in the WSRP require irrigation, and irrigation is used to manage canopy size and manipulate vine physiology. White wine cultivars 'Riesling,' 'Chardonnay,' and 'Gewürztraminer' comprise about 60% of the production, and 'Cabernet Sauvignon,' 'Merlot' and 'Syrah' are the principal red wine cultivars.

Collaborative research between the UI and Oregon State University continues on the development of honeyberry or haskap (edible-fruited blue honeysuckle) cultivars. Nineteen genotypes have been selected for cooperator trials, with six additional early selections at the UI being evaluated for fruit production. Cooperator trials in western Oregon, Western Washington, and northern Idaho are scheduled for planting in the spring of 2007.

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: 2006

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)	$1,970,787		
This FY Target Amount	492,697		

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*	316,531
Goal 2: *A Safe and Secure Food and Fiber System*	38,187
Goal 3: *A Healthy, Well Nourished Population*	33,381
Goal 4: *Greater Harmony Between Agriculture and the Environment*	91,437
Goal 5: *Enhanced Economic Opportunity and Quality of Life for Americans*	13,161
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

6/11/2007

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, 403, 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: *501, 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, 701, 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, 802, 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.*