ANNUAL REPORT OF ACCOMPLISHMENTS AND RESULTS

for the
Pennsylvania Agricultural
Experiment Station
at
The Pennsylvania State University

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Goal 1
An agricultural system that is highly competitive in the global economy.
Through research and education, empower the agricultural system with knowledge that will improve the competitiveness in domestic production, processing, and marketing.

Executive Summary: The Pennsylvania Agricultural Experiment Station continues to focus on research projects that reinforce a globally competitive agricultural system. During FY2006, 194 projects supported Goal 1 themes. The four planned projects that are featured below illustrate accomplishments and impacts within this Goal. Further Hatch-supported research includes the following examples. Interest in reduced-tillage production options remains strong in Pennsylvania. The use of cover crops without reliance on herbicides to 'burn down' the cover in the spring has been a barrier to further adoption of this erosion and weed control technique. Hatch funds have supported research on the successful use of a roller/crimper to kill cereal rye used as a winter cover crop, resulting in the use of reduced herbicide rates (reductions of 75-88 percent compared to treatments without rolling) prior to no-till planting of either corn or soybeans. In other experiments with hairy vetch and winter rape, rolling had less impact on herbicide reduction. These results will provide options to both conventional and organic crop producers. Multistate Hatch funding supported continuing research and monitoring for Plum Pox Virus (PPV) in south-central Pennsylvania where it was first detected in 1999. Research on weed reservoirs, surveillance using sentinel trees and bait plants, and aphid transmission complemented work conducted by the Pennsylvania Department of Agriculture and the U.S. Department of Agriculture (ARS and APHIS). The combined surveillance work of these organizations and Penn State, plus the research efforts on transmission and persistence of PPV, led to the lifting of the PPV quarantine in some portions of the region. This will permit growers to replant peaches, which is a critical component of the economic portfolio for growers, the labor force, and the region.

Expenditures of Hatch and Multistate Hatch funds in projects related to Goal 1 were approximately $3.74 million in FY2006, a slight decrease of 1.7 percent from the FY2005 level of $3.80 million. Overall expenditures tracking to Goal 1 projects were higher ($40 million in FY2006, up nearly 3.6 percent from FY2005). State appropriated expenditures increased approximately 3.6 percent and external grant expenditures increase approximately 4.8 percent during FY2006. Five new faculty hired during FY2006 have a significant portion of their proposed research activities within Goal 1 themes. In addition, one faculty member will also be contributing to Goal 4. Graduate students are assigned to goals in proportion to faculty assignments. Approximately 310 graduate students can be expected to be working on research projects consistent with Goal 1 themes.

Many of these research results are communicated to stakeholders through a variety of methods, but we continue to rely on the close connection between Experiment Station-sponsored research and the Penn State Cooperative Extension Service. Goal 1 outputs can be directly referenced in Penn State Cooperative Extension's Annual Report of Accomplishments and Results. Further accomplishments and outputs, including publications, can be found in by searching Pennsylvania projects in CRIS at http://cris.csrees.usda.gov/menu.html. Pennsylvania researchers also rely on traditional means of disseminating information, including publication in technical, popular, and trade outlets, presentations to stakeholders and policymakers, and web-based delivery methods. Our research results reach audiences in Pennsylvania, the nation, and the world.

Multistate projects are an important part of our activity under Goal 1 themes. Twenty-eight of our experiment station projects contribute to multistate projects within Goal 1 (NC-0140, NC-0205, NC-1009, NC-1014, NC-1020, NC-1023, NC-1025, NC-1119, NC-1142, NE-0009, NE-1006, NE-1008, NE-1009, NE-1014, NE-1015, NE-1017, NE-1019, NE-1020, NE-1022, NE-1024, NE-1025, S-1000, S-1008, S-

1019, S-1020, S-1021, S-1025, W-1181). Individual impact statements are available on the web at the National Information Management and Support Systems at http://nimss.umd.edu/.

Allocated FTEs to Goal (in units):

SY	PY	TY	CY	TOTAL
181.5	264.1	37.0	100.4	583.0

Total Expenditures directed to Goal ($ in thousands): [1]

Hatch	Multistate Hatch	McIntire-Stennis	Animal Health	State Appropriated	Leveraging Dollars	Total
$3,032	$704	$414	$57	$17,750	$18,093	$40,049

The following agencies/sponsors provided leveraging dollars:

Academy of Applied Science
AgoFresh Inc.
AgriCulver Seeds
Alliance for Cancer Gene Therapy
American Chestnut Foundation
American Cocoa Research Institute
American Heart Association
Arnold and Mabel Beckman Foundation
Bausch and Lomb Inc.
Bayer CropScience
Binational Agricultural Research and Development
California Institute for Energy Efficiency
Case New Holland
Center for Rural Pennsylvania
Chemgro Seeds
Chester County Conservation
Chevron Texaco
Chocolate Manufacturers Association
ConAgra Foods Retail Products
Corn States Hybrid Service
Corn Synergy Research
Dairy Management Inc.
David and Lucile Packard Foundation
E. I. DuPont De Nemours and Company
Energizer Battery Manufacturing, Inc.
Estee Lauder Companies
Featherstone Seed Inc.
Florida Department of Agriculture
Garst Seed
General Mills
Golden Harvest Seeds Inc.
Golf Course Superintendent Association of America
Gromark FS Inc.
JEM Co., Ltd.
Johnson and Johnson
Leukemia and Lymphoma Society
McKnight Foundation
Meiji Feed Co. Ltd.
Monsanto Company
National Blood Foundation
National Honey Board
National Institutes of Health
National Livestock Research Institute
National Pork Board
National Science Foundation
National Starch
National Wild Turkey Federation
National Wooden Pallet and Container Association
New York Farm Viability Institute Inc.
Northwest Medical Research Partners Inc.
Ohio Seed Improvement Association
Penn State Applied Research Laboratory
Pennsylvania Department of Agriculture
Pennsylvania Department of Community and Economic Development
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Department of Education
Pennsylvania Department of Health
Pennsylvania Department of Transportation
Pennsylvania Fish and Boat Commission
Pennsylvania Forest Products Association
Pennsylvania Game Commission
Pennsylvania Soybean Promotion Board
Pioneer Hi-Bred International Inc.
Plant Health Care Inc.
Renaissance Nutrition Inc.
Rodale Institute
Royster Clark Inc.
SeedWay LLC
Select Sires Inc.
State Horticultural Association of Pennsylvania
Steyer Seeds
Syngenta
Unisouth Genetics Inc.
United Agri Products
United States Agency for International Development
United States Department of Agriculture
United States Department of Defense
United States Department of Energy
United States Department of Interior
United States Department of the Navy
United States Golf Association
United States Highbugh Blueberry Council

United States Marine Corps
United States Southern Africa Partnership for Agriculture
University of California, Davis
Virginia Apple Research Program

Planned Program: Analysis of Market Forces and Policy on the U.S. and Pennsylvania Dairy Industry (PEN03757 – Bailey)

Key Themes: Agricultural Competitiveness; Agricultural Profitability

Brief Description: Milk production in Pennsylvania is increasingly affected by exogenous market factors and changing policies that directly or indirectly affect milk supply, demand, and prices. Changing market forces will increasingly become an important issue to Pennsylvania as the dairy price support program is phased out and federal milk marketing orders become more market oriented. This planned program is developing an analytical tool to analyze alternative dairy policies and assess the impact of exogenous factors on the Northeast and Pennsylvania dairy industry.

Impact/Accomplishment Statement: A major obstacle to modeling the U.S. dairy sector is developing a methodology to track the supply and use of milk components. Only 30 percent of the protein and 20 percent of the fat in milk go "into the bottle," so the market for these high-value components is a defining factor influencing milk production and marketing strategies. A methodology has been developed to not only assess trade, but also to track supply and demand of milk components through the U.S. dairy industry. This methodology has been applied to an analysis of milk protein imports and to examine the component data for dairy herds in the Mideast Federal Milk Marketing Order. The data from this analysis have been translated to the Pennsylvania dairy industry – producers and feed suppliers – to help them adjust their actions to maximize return on expenditures. Results of this research project have been used to prepare analyses of policy options for the Pennsylvania Department of Agriculture and other interested parties as discussions of the 2007 Farm Bill have proceeded.

Sources of Funding: Hatch Act and State appropriated funds.

Scope of Impact: State Specific; Multistate Research; Integrated Research and Extension

Planned Program: Development and Implementation of Fruit Disease Management Programs Utilizing Traditional and Alternative Approaches (PEN03844 – Travis)

Key Themes: Plant Production Efficiency; Plant Health; Organic Agriculture

Brief Description: This planned program focuses on the development and implementation of traditional and alternative disease management programs. Areas of emphasis include the assessment of disease impact, the biology of fruit pathogens, evaluation of minimal use pesticide strategies, development of alternative disease management strategies, and the utilization of new technologies to assist growers in disease management decision making. The Pennsylvania tree fruit industry is at a point of transition. Cultural practices and pest control methods utilized over the last 40 years are being replaced by new approaches to growing fruit and managing pests that are profitable for the growers, fresh fruit packers, and processors while being environmentally sound and focused on meeting consumers' expectations for food safety and quality. One alternative for the industry that emerges from alternative disease management strategies is the opportunity to consider organic apple production. There is considerable interest in organic produce from growers, processors, and consumers.

Impact/Accomplishment Statement: This planned program is leading to a greater understanding of the biological management system to improve fruit tree health and reduce tree fruit root disease and nematode replant problems. Results show that the use of compost and other orchard floor treatments is expected to be profitable for tree fruit growers in Pennsylvania, since it has the potential to replace soil fumigation, minimize fertilizer use, and have a positive influence on tree health and productivity.

Fruit growers receive information on pesticides and biological alternatives for disease management through extension publications such as production guides, grower educational meetings, and newsletters as a result of this program. Growers often report that this type of information may save them one to two spray applications per season. For example, growers utilizing this type of information to make management decisions would save $40 per acre over a season. If this savings is calculated on the 15,000 acre fruit production regions of the state, the savings would be $600,000 to fruit growers in Pennsylvania.

Penn State received organic certification for two acres of apple orchards at our Fruit Research and Extension Center in Adams County, Pennsylvania, in 2006. The first certified organic crop was harvested in the fall of 2006, and a portion of this crop was purchased at premium prices by a local grower-owned cooperative processing plant. This effort, which involves over 20 experiment station scientists and extension educators, has generated considerable interest among growers. Several Pennsylvania growers have committed to beginning the transition process to organic for a portion of their orchard acreage.

Sources of Funding: Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from E.I. DuPont De Nemours and Company, Pennsylvania Department of Agriculture, State Horticultural Association of Pennsylvania, and United States Department of Agriculture.

Scope of Impact: State Specific; Integrated Research and Extension

Planned Program: Improving the Profitability of Dairy Farms in Pennsylvania and the United States (PEN03864 - Hyde)

Key Themes: Agricultural Profitability; Managing Change in Agriculture; Small Farm Viability

Brief Description: As the economic landscape shifts, dairy producers, like all other farmers, must become increasingly business-minded to remain in operation over the long-run. Applied research is necessary to obtain information related to technology adoption, hiring custom work, farm expansion, and other related issues to help dairy producers make more informed business decisions. A key factor that may dictate farm sustainability is labor.

Impact/Accomplishment Statement: The adoption of robotic milker technology is dependent upon estimates of value of replacing current technologies and attempting to predict an uncertain future. An on-line tool (RobotValue) was developed and is used nationally and internationally by farmers and consultants in technology adoption decision support. The critical role of labor decisions emerges as one of the most important variables in technology adoption, and labor drives many other management decisions on dairy farms. A critical study of human resource management practices was conducted for 40 Pennsylvania dairy farms, looking at whether farms have standard operating procedures for such tasks as milking, feeding, and breeding, the extent to which farm owner/operators have written job descriptions for their employees and conduct annual performance evaluations, and issues arising from the need for bilingual communication in the workplace. These studies are standard practice in many industries, but are underutilized in agriculture and have not been rigorously examined in dairy. Results are identifying key

pressure points in labor management that can be addressed to increase profitability, lead to financial sustainability, and help reduce the stress of change in the industry.

Sources of Funding: Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from the Center for Rural Pennsylvania.

Scope of Impact: State Specific; Integrated Research and Extension

Planned Program: Improving Corn Silage, Wheat and Barley Production in Pennsylvania (PEN03965 – Roth)

Key Themes: Agricultural Profitability; Plant Germplasm

Brief Description: Corn hybrids with improved silage quality, hard wheats for local milling markets, and hulless barley lines for the local feed and ethanol industry may have potential for adding value to these crops produced in Pennsylvania compared to conventional varieties. This planned program evaluates the potential of corn hybrids selected specifically for silage production for use on dairy farms. The program also evaluates the potential of new hard wheat and hulless barley lines for their potential in Pennsylvania.

Impact/Accomplishment Statement: The results of this planned program are documenting that some hybrids in our tests yield 11-12 percent higher than the average entry. These results were distributed to producers for use in hybrid selection by dairy producers. Corn silage production in Pennsylvania is valued at $185 million dollars. If, through hybrid selection, producers could improve corn silage yield performance by just two percent, this would result in $3.7 million annually to Pennsylvania corn silage producers. Two producers, who based their entire production on the data, reported a 5 to 10 percent improvement in performance on the 400 acres they represent, which would result in an economic benefit of $8,000 to $16,000. Forage quality differences could have additional impact. Our relationship with a key dairy producer organization and a number of seedsmen in the state has led to the continued development of hybrids that are screened for high yields and quality in silage production. The silage evaluations conducted across the state have provided data to a number of small Pennsylvania seed companies, which has led them to shift their hybrid selections and marketing programs. Our wheat and barley research programs have also generated interest by commodity brokers, seedsmen and producers regarding alternative wheat and barley varieties. New hard wheat varieties have been introduced to growers in the region. If they appear to be profitable, then new opportunities could be developed that could have significant environmental and economic benefits. An outcome that is being explored with producers is the possibility of growing identity-preserved wheat – specific varieties grown for specific buyers.

Sources of Funding: Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from AgriCulver Seeds, Bayer CropScience, Chemgro Seeds, Corn States Hybrid Service, Corn Synergy Research, Featherstone Seed Inc., Garst Seed, Golden Harvest Seeds Inc., Growmark FS Inc., Monsanto, Ohio Seed Improvement Association, Pennsylvania Department of Agriculture, Pennsylvania Soybean Promotion Board, Pioneer Hi-Bred International Inc., Plant Health Care Inc., Renaissance Nutrition Inc., Royster Clark Inc., SeedWay LLC, Steyer Seeds, Syngenta, Unisouth Genetics Inc., and United Agri Products.

Scope of Impact: Integrated Research and Extension

Goal 2
A safe and secure food and fiber system.

To ensure an adequate food and fiber supply and food safety through improved science-based detection, surveillance, prevention, and education.

Executive Summary: The Pennsylvania Agricultural Experiment Station supports a variety of projects that contribute to safe, secure food and fiber production. During FY2006, 30 projects supported Goal 2 themes. The planned program featured below illustrates accomplishments and impacts within this Goal. Hatch funding supported the examination of how the phenolic chemistry of foods interacts with food processing techniques to influence flavor quality attributes. *Campylobacter* contamination on chicken carcasses at some Pennsylvania processing facilities was examined. Initial studies suggest promise for use of various antimicrobials at key processing steps, although additional research is clearly indicated. New information technology approaches were developed to combine the sensitivity of two types of sensors – the "e-nose" and "zNose" – leading to improved classification accuracy. Damaged apples could be separated from healthy apples with an accuracy of 97-100 percent. This technology will have value to retailers as a rapid and accurate tool for detecting damaged produce prior to sale.

Expenditures of Hatch and Multistate Hatch funds in projects related to Goal 2 were approximately $223,486 in FY2006, a decrease of over 11.6 percent from the FY2005 level of $252,691. Overall expenditures tracking to Goal 2 projects were lower ($2.4 million in FY2006, down 8.3 percent from FY2005). State appropriated expenditures increased 30.1 percent while external grant expenditures significantly decreased by 23.1 percent during FY2006. One new faculty hired during FY2006 would be characterized as having proposed research activities within Goal 2 themes. Graduate students are assigned to goals in proportion to faculty assignments. Approximately 23 graduate students can be expected to be working on research projects consistent with Goal 2 themes.

The important food processing industry in Pennsylvania maintains effective communication links to the station through the various state and national trade associations. Other stakeholder concerns on the subject of food safety come through guidance of our Ag Council http://agcouncil.cas.psu.edu. The joint appointments that many of our researchers hold with the Cooperative Extension function of our College also provide a route for communicating stakeholder needs into the Experiment Station research enterprise.

Many of these research results are communicated to stakeholders through a variety of methods, but we continue to rely on the close connection between Experiment Station-sponsored research and the Penn State Cooperative Extension Service. Goal 2 outputs can be directly referenced in Penn State Cooperative Extension's Annual Report of Accomplishments and Results. Further accomplishments and outputs, including publications, can be found in by searching Pennsylvania projects in CRIS at http://cris.csrees.usda.gov/menu.html. Pennsylvania researchers also rely on traditional means of disseminating information, including publication in technical, popular, and trade outlets, presentations to stakeholders and policymakers, and web-based delivery methods. Our research results reach audiences in Pennsylvania, the nation, and the world.

Multistate projects are an important part of our activity under Goal 2 themes. Five of our experiment station projects contribute to multistate projects within Goal 2 (NC-1025, NE-1008, NE-1009, S-1019, S-1021). Individual impact statements are available on the web at the National Information Management and Support Systems at http://nimss.umd.edu/.

Allocated FTEs to Goal (in units):

SY	PY	TY	CY	TOTAL
14.7	17.5	0.0	5.1	37.3

Total Expenditures directed to Goal ($ in thousands): [1]

Hatch	Multistate Hatch	McIntire-Stennis	Animal Health	State Appropriated	Leveraging Dollars	Total
$194	$29	$0	$0	$879	$1,307	$2,409

The following agencies/sponsors provided leveraging dollars:

Academy of Applied Science
American Heart Association
American Meat Institute Foundation
Bausch and Lomb Inc.
Case New Holland
ConAgra Foods Retail Products
National Cattlemen's Beef Association
National Institutes of Health
National Livestock Research Institute
Northwest Medical Research Partners Inc.
Pennsylvania Department of Agriculture
Pennsylvania Department of Community and Economic Development
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Department of Education
United States Department of Agriculture
United States Department of Energy
United States Department of Agriculture
United States Highbugh Blueberry Council
World Health Organization

Planned Program: Detection, Tracking, and Control of Foodborne Pathogens (PEN03952 – Knabel)

Key Themes: Food Handling, Food Safety; Foodborne Illness; Foodborne Pathogen Protection

Brief Description: Listeriosis due to food contamination with *Listeria monocytogenes* represents a significant health risk to humans. Most cases of listeriosis are caused by relatively few “epidemic clones” of *L. monocytogenes* strains. *Listeria monocytogenes* contamination in food plants is widespread, but most contaminants are not strains that correspond to these epidemic clones. Thus, methods to identify and track the epidemic clones are necessary. Genetic variation exists within the genes responsible for virulence in these epidemic clones, and this variation can be exploited to develop diagnostic tools.

Impact/Accomplishment Statement: A Multi-Virulence-Locus Sequence Typing (MVLST) method was developed under earlier support from this project to target six virulence genes in *Listeria monocytogenes*. The tool has now been validated by testing 58 isolates from 14 outbreaks and 49 non-outbreak isolates. MVLST provided equivalent discrimination power to Pulsed Field Gel Electrophoresis, the standard diagnostic tool, and further identified previously-identified epidemic clones and suggested the presence of a novel clone. This tool was used to examine two recent multistate listeriosis outbreaks in the U.S. and proved to provide superior discriminatory power for subtyping *L. monocytogenes* strains and identifying an epidemic clone in the isolates. Work in progress combines a variety of these tests to develop a diagnostic protocol that will simultaneously screen for the presence of *L. monocytogenes*, determine its serotype, and identify whether it represents an epidemic clone. The MVLST approach will provide food company, government, and academic laboratories with a comprehensive molecular strategy for detection and control of *L. monocytogenes*.

Sources of Funding: Hatch Act, Multistate Hatch Act, and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from United States Department of Agriculture.

Scope of Impact: State Specific

Goal 3
A healthy, well-nourished population.

Through research and education on nutrition and development of more nutritious foods, enable people to make health promoting choices.

Executive Summary: The Pennsylvania Agricultural Experiment Station engages in a variety of projects that contribute to a healthy, well-nourished citizenry. During FY2006, 21 projects supported Goal 3 themes. The planned program featured below illustrates accomplishments and impacts within this Goal. Hatch funding supports work on a class of nuclear receptor genes that interact with dietary fatty acids. Given the substantial interest in conjugated linoleic acids and other polyunsaturated fatty acids for their possible positive influences on diabetes and cancer, this work is revealing how diet may interact with therapeutic drugs to design more effective treatments and therapies for important human diseases. Continuation of Hatch-supported work on the probiotic microorganism *Bifidobacterium animalis* ssp. *lactis* has focused on use of new pyrosequencing technologies to obtain a complete genome sequence. This sequence will facilitate the development of strain-specific markers of bifidobacteria, which are critical to commercialize these bacteria (regulatory agencies and food manufacturers will require the ability to track specific strains).

Expenditures of Hatch and Multistate Hatch funds in projects related to Goal 3 were approximately $111,811 in FY2006, an increase of 4.3 percent over the FY2005 level of $107,189. Overall expenditures tracking to Goal 3 projects were higher ($1.9 million in FY2006, up 13.3 percent from FY2005). State appropriated expenditures increased by approximately 6.3 percent and external grant expenditures significantly increased by 21.4 percent during FY2006. No new faculty hired during FY2006 would be characterized as having proposed research activities within Goal 3 themes. Graduate students are assigned to goals in proportion to faculty assignments. Approximately 19 graduate students can be expected to be working on research projects consistent with Goal 3 themes.

Many of these research results are communicated to stakeholders through a variety of methods, but we continue to rely on the close connection between Experiment Station-sponsored research and the Penn State Cooperative Extension Service. Goal 3 outputs can be directly referenced in Penn State Cooperative Extension's Annual Report of Accomplishments and Results. Further accomplishments and outputs, including publications, can be found in by searching Pennsylvania projects in CRIS at http://cris.csrees.usda.gov/menu.html. Pennsylvania researchers also rely on traditional means of disseminating information, including publication in technical, popular, and trade outlets, presentations to stakeholders and policymakers, and web-based delivery methods. Our research results reach audiences in Pennsylvania, the nation, and the world.

No multistate projects would be characterized as having proposed research activities within Goal 3 themes.

Allocated FTEs to Goal (in units):

SY	PY	TY	CY	TOTAL
11.0	12.9	0.0	3.7	27.7

Total Expenditures directed to Goal ($ in thousands): [1]

Hatch	Multistate Hatch	McIntire-Stennis	Animal Health	State Appropriated	Leveraging Dollars	Total
$112	$0	$0	$0	$775	$1,051	$1,938

The following agencies/sponsors provided leveraging dollars:

Academy of Applied Science
American Heart Association
Bausch and Lomb Inc.
E. I. DuPont De Nemours and Company

Johnson and Johnson
National Institutes of Health
National Science Foundation
Pennsylvania Department of Agriculture
Pennsylvania Department of Community and Economic Development
United States Department of Agriculture
United States Department of the Navy
World Health Organization

Planned Program: Agricultural Safety and Health for Farm Families and Farm Workers (PEN03874 –Murphy)

Key Themes: Ag Waste Management; Farm Safety; Workforce Safety; Youth Farm Safety

Brief Description: This planned program, which was originally reported in the Annual Report of Accomplishments and Results for fiscal year 2003, has continued research to develop methods and procedures to assess and classify farm and agricultural industry events and to develop new methods and procedures for educating adults and youth to work safely on the farm.

Impact/Accomplishment Statement: The Pennsylvania agriculture fatal injury rate has fallen by 39 percent in ten years. A preliminary automated intervention to prevent rear tractor overturn was successfully tested. Instructor workshops for the National Safe Tractor and Machinery Operation Program (NSTMOP) have resulted in the training of 58 State Master Trainers (SMT) from 38 states. The training materials are also now web accessible. Between the SMT and web training modules, 439 Community Lead Instructors (CLI) have been trained and are now offering the NSTMOP to 14-15 year old youth across the U.S who seek certification as a safe tractor and machinery operator so that they can be legally employed for farm work. Reporting of classes and student numbers is not required but we know that at least 210 youth have been certified to safely operate tractors and machines from 26 classes in seven states. Successful computation fluid mechanics modeling of manure gasses provides data for development of a manure ventilation safety standard.

Sources of Funding: Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from National Institutes of Health.

Scope of Impact: Multistate Integrated Research and Extension

Goal 4

An agricultural system which protects natural resources and the environment.

Enhance the quality of the environment through better understanding of and building on agriculture's and forestry's complex links with soil, water, air, and biotic resources.

Executive Summary: The Pennsylvania Agricultural Experiment Station supports a variety of projects that contribute to protection of natural resources and the environment. In fact, most of our experiment station projects have elements of natural resource and environmental impacts. During FY2006, 99 projects specifically supported Goal 4 themes. The two planned programs featured below illustrate accomplishments and impacts within this Goal. In addition, Hatch funds support research on odor and ammonia emissions from livestock production facilities. Ammonia levels, in particular, are now of interest in meeting Clean Air standards, and few data have been available for livestock facilities as opposed to the industrial settings for which standards were initially created. A series of projects has developed methodology for testing ammonia production in dairy and poultry facilities, and data collection is now underway to establish the emission rates from different types of structures and operations. Collection of ground-level ozone data in four non-urban locations around Pennsylvania provides real-time data on Pennsylvania air quality to the Pennsylvania Department of Environmental Protection, and these

data sets will also be used by the US EPA to help establish secondary National Ambient Air Quality Standards at their next review period. The impact of ozone levels on grape growth was assessed at our Fruit Research and Extension Center in Biglerville, Pennsylvania. Certain grape varieties are particularly sensitive to ozone, and more detailed understanding of air quality impacts on plant growth will help Penn State personnel in advising local growers about cultivar choices. Tillage practices have a direct influence on water quality in the Pennsylvania landscape, and we have been encouraging a transition to no-till wherever practical. However, soil compaction is an unintended consequence of no-till agriculture, and Hatch funds are supporting research on yield relationships to tillage and compaction. These studies have led to recommendations on how to manage soil compaction in continuous no-till systems on Pennsylvania dairy farms.

Expenditures of Hatch and Multistate Hatch funds in projects related to Goal 4 were approximately $1.23 million in FY2006, a slight decrease of approximately 2.8 percent over the FY2005 level of $1.26 million. Overall expenditures tracking to Goal 4 projects were higher ($11.9 million in FY2006, up 8.5 percent from FY2005). State appropriated expenditures increased approximately 3.6 percent and external grant expenditures increased approximately 16.2 percent during FY2006. One new faculty hired during FY2006 would be characterized as having a portion of their proposed research activities within Goal 4 themes. This faculty member will also be partially supporting Goal 1 themes. Graduate students are assigned to goals in proportion to faculty assignments. Approximately 90 graduate students can be expected to be working on research projects consistent with Goal 4 themes.

Many of these research results are communicated to stakeholders through a variety of methods, but we continue to rely on the close connection between Experiment Station-sponsored research and the Penn State Cooperative Extension Service. Goal 4 outputs can be directly referenced in Penn State Cooperative Extension's Annual Report of Accomplishments and Results. Further accomplishments and outputs, including publications, can be found in by searching Pennsylvania projects in CRIS at http://cris.csrees.usda.gov/menu.html. Pennsylvania researchers also rely on traditional means of disseminating information, including publication in technical, popular, and trade outlets, presentations to stakeholders and policymakers, and web-based delivery methods. Our research results reach audiences in Pennsylvania, the nation, and the world.

Multistate projects are an important part of our activity under Goal 4 themes. Fourteen of our experiment station projects contribute to multistate projects within Goal 4 (NC-0205, NC-1017, NC-1020, NE-1013, NE-1017, NE-1019, NE-1021, NRSP-0003, S-1024, S-1025, W-1082, W-1133, W-1170, W-1188). Individual impact statements are available on the web at the National Information Management and Support Systems at http://nimss.umd.edu/.

Allocated FTEs to Goal (in units):

SY	PY	TY	CY	TOTAL
52.1	73.7	10.2	40.6	176.6

Total Expenditures directed to Goal ($ in thousands): [1]

Hatch	Multistate Hatch	McIntire-Stennis	Animal Health	State Appropriated	Leveraging Dollars	Total
$865	$362	$44	$0	$4,890	$5,781	$11,941

The following agencies/sponsors provided leveraging dollars:

Academy of Applied Science
Academy of Natural Science
American Cocoa Research Institute
Arnold and Mabel Beckman Foundation
Bausch and Lomb Inc.
Binational Agricultural Research and Development
Boyertown Foundry Company
California Institute for Energy Efficiency
Center for Rural Pennsylvania
Centre County Government

Chester County Conservation
Chocolate Manufacturers Association
David and Lucile Packard Foundation
Energizer Battery Manufacturing, Inc.
Environmental Protection Agency
Estee Lauder Companies
Georgia-Pacific Resins, Inc.
JEM Co. Ltd.
Littlestown Foundry Inc.
Monsanto Company
NASA
National Institutes of Health
National Science Foundation
National Wild Turkey Federation
New York Farm Viability Institute Inc.
Penn State Office of Physical Plant
Pennsylvania Department of Agriculture
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Department of Environmental Protection
Pennsylvania Department of Transportation
Pennsylvania Fish and Boat Commission
Pennsylvania Game Commission
Pennsylvania Soybean Promotion Board
Unicast Company
United States Department of Agriculture
United States Department of Energy
United States Department of Interior
United States Department of the Navy
University of California, Davis

Planned Program: Nutrient Management in Crop-Livestock Systems (PEN03941 – Beegle)

Key Themes: Agricultural Waste Management; Nutrient Management; Water Quality

Brief Description: Nutrient management is critical to maximize the economic benefit of nutrients and minimize the environmental impact. This planned program evaluates the application of nitrogen and phosphorus management strategies and is developing decision support systems for managing residual nutrients in crop-livestock systems.

Impact/Accomplishment Statement: Development and validation of a water extractable phosphorous (WEP) test for manures was completed. An inter-laboratory study of seven commercial and university laboratories had previously demonstrated the precision of this test, which can accurately distinguish P variation due to livestock species and manure storage and handling systems. This test was implemented in the Penn State Manure Analysis program in 2006 and was adopted for use in the revised Pennsylvania Phosphorous Index, which is included in the new state and federal nutrient management regulations adopted in 2006. Both the original P Index and the current revisions to the P Index were developed largely on the basis of work conducted under this Hatch project. Adoption of the P Index targets management to minimize P loss from fields treated with over one half of the manure produced in Pennsylvania, leading to positive effects on water quality. A study continued to collect data that could help reconcile conflicts between no-till best management practices and manure application best management practices, examining, for example, manure injection practices and relative N and P losses. A research component on odor impacts of these injection systems was initiated.

Sources of Funding: Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from Environmental Protection Agency, Pennsylvania Department of Agriculture, and United States Department of Agriculture.

Scope of Impact: State Specific; Multistate Research; Integrated Research and Extension

Planned Program: Chemistry, Bioavailability, and Toxicity of Constituents in Residuals and Residual-Treated Soils (PEN04058 –Stehouwer)

Key Themes: Agricultural Waste Management; Nutrient Management; Biofuels

Brief Description: This planned program is aligned with multistate hatch project W-1170 to conduct studies to evaluate changes in soils and soil ecosystems due to residual additions. Work is being done on soils contaminated by traditional contaminants (i.e., heavy metals and toxic organics) and on soils that pose an environmental threat due to excess fertilization. Evaluations of the long-term bioavailability of nutrients, trace elements, and organic constituents in residual amended soils are being conducted at long-term field sites.

Impact/Accomplishment Statement: A long-standing interest in reclamation of mining sites has recently intersected with the potential for these sites to be used in bioenergy feed stock production. Five reclamation treatments were applied to an abandoned coal mine site, including a conventional treatment (lime and fertilizer), two rates of composted chicken manure, and two rates of paper mill sludge (to adjust the carbon:nitrogen ratio) mixed with fresh chicken manure. The experimental sites were planted with switchgrass (*Panicum virgatum*). Vegetation established most rapidly on the conventionally treated site, but, once established, vegetation growth was significantly higher on the co-application treatments compared to the conventional treatment. Nutrient leaching data revealed variable rates of nutrient loss from the different treatments and suggest that source-specific Phosphorous Source Coefficients may be necessary to adequately monitor P leaching and identify vulnerable sites that require alternative P-management strategies. These results are encouraging for abandoned mine reclamation, biomass production, and nutrient management

Sources of Funding: Hatch Act, Multi-State Hatch Act, and State appropriated funds. This planned program also leveraged the appropriated funds by receiving funds from Boyertown Foundry Company, Littlestown Foundry Inc., and Unicast Company.

Scope of Impact: Multistate Integrated Research and Extension

Goal 5
Enhanced economic opportunity and quality of life for Americans.

Empower people and communities, through research-based information and education, to address economic and social changes facing our youth, families, and communities.

Executive Summary: The Pennsylvania Agricultural Experiment Station supports a variety of projects that contribute to enhanced economic opportunity and quality of life. During FY2006, 51 projects supported Goal 5 themes. The planned programs featured below illustrate accomplishments and impacts within this Goal. Hatch funding also supported research that examined the importance of participation in the informal economy as a means for boosting incomes above the poverty level, especially for rural elders who are underemployed relative to urban and younger demographics. Research on this topic revealed that a combination of income from the formal and informal economies is both common and important in rural Pennsylvania and reinforced the finding that rural children as a group are increasingly affected by poverty. This research led to a policy brief on rural poverty, a presentation to NIH professional staff concerning the importance of inclusion of rural children in the NIH National Children's Study (this demographic has been included), and policy presentations at conferences sponsored by USDA-ERS, the Rural Policy Research Institute, and the Brookings Institution. Multistate Hatch funding supported a study of the impact of "big-box" retailers on poverty and self-employment at the county level. While the presence of "big-box" retailers was associated with higher poverty levels, self-employment – which is a mechanism to escape poverty – increased subsequent to "big-box" establishment. However, this project also showed that, in these communities, levels of participation in civic activities tended to decline. These data are being used widely in local discussions of community decision-making, and the Chief Economist of the U.S. Small Business Administration's Office of Advocacy is using the self-employment data in policy development. Examination of the impact of service learning projects on minority youth

demonstrated that service learning experiences that specifically incorporated cultural competence, input from the participating youth, and connection to community needs led to positive change in interactions with peers and in perception of school and community.

Expenditures of Hatch and Multistate Hatch funds in projects related to Goal 5 were approximately $420,418 in FY2006, an increase of approximately 16.8 percent over the FY2005 level of $359,844. Overall expenditures tracking to Goal 5 projects were higher (approximately $3.5 million in FY2006, up 10.4 percent from FY2005). State appropriated expenditures increased approximately 4 percent and external grant expenditures increased by approximately 19.2 percent during FY2006. Two new faculty hired during FY2006 would be characterized as having proposed research activities primarily within Goal 5 themes. Graduate students are assigned to goals in proportion to faculty assignments. Approximately 33 graduate students can be expected to be working on research projects consistent with Goal 5 themes.

Many of these research results are communicated to stakeholders through a variety of methods, but we continue to rely on the close connection between Experiment Station-sponsored research and the Penn State Cooperative Extension Service. Goal 5 outputs can be directly referenced in Penn State Cooperative Extension's Annual Report of Accomplishments and Results. Further accomplishments and outputs, including publications, can be found in by searching Pennsylvania projects in CRIS at http://cris.csrees.usda.gov/menu.html. Pennsylvania researchers also rely on traditional means of disseminating information, including publication in technical, popular, and trade outlets, presentations to stakeholders and policymakers, and web-based delivery methods. Our research results reach audiences in Pennsylvania, the nation, and the world.

Multistate projects are an important part of our activity under Goal 5 themes. Five of our experiment station projects contribute to multistate projects within Goal 5 (NC-1001, NE-1011, NE-1012, S-1019, S-1021). Individual impact statements are available on the web at the National Information Management and Support Systems at http://nimss.umd.edu/.

Allocated FTEs to Goal (in units):

SY	PY	TY	CY	TOTAL
18.6	18.3	0.0	8.2	45.1

Total Expenditures directed to Goal ($ in thousands): [1]

Hatch	Multistate Hatch	McIntire-Stennis	Animal Health	State Appropriated	Leveraging Dollars	Total
$294	$127	$16	$0	$1,781	$1,313	$3,530

The following agencies/sponsors provided leveraging dollars:

Center for Rural Pennsylvania
Centre County Office of Mental Health/Mental Retardation and Drug and Alcohol
Kauffman Foundation
National Institutes of Health
National Science Foundation
National Wild Turkey Federation
Pennsylvania Department of Agriculture
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Game Commission
United States Department of Agriculture
United States Department of Interior

Planned Program: The Changing Rural Family: Consequences of Adolescent Childbearing and Female Headship on Well-Being (PEN03865 – Snyder)

Key Themes: Children, Youth, and Families at Risk; Impact of Change on Rural Communities

Brief Description: The causes and implications of changing family structure are largely unknown in rural areas of the United States. Although family structures are becoming more similar across metro-urban,

metro-suburban, and non-metro areas, variability in family structure remains, especially in union formation experiences, prevalence of cohabiting families with children, and the odds of teen or nonmarital birth. These factors have an impact on the economic well-being of all families. This planned program examines changes in family structure, focusing on various forms of female-headed families and corresponding changes in the well-being of families and children in rural areas. This program emphasizes risk and protective factors that impact the well-being of adolescent parent families in rural areas.

Impact/Accomplishment Statement: This planned program has revealed a number of important factors affecting family well-being that vary by geographic residence. Non-metro areas have a higher proportion of families living in emerging household arrangements, such as cohabiting parents and grandparent-headed households with children, although non-metro cohabiting unions persist for a shorter period of time than is the case in metro areas. Non-metro households are also more economically vulnerable than those in metro areas. These non-metro female-headed and cohabiting households with children had the highest poverty levels in the study and were the heaviest users of all forms of public assistance, regardless of race or ethnic group. This planned program also demonstrated that social security is a very important income source for non-metro grandparent-headed households with children, especially among racial and ethnic minority households. These data on cohabiting, female-headed, and grandparent-headed households in non-metro areas are new – especially among Hispanic and Native American communities. These types of households have been understudied in the rural sociology literature. The findings from this work are being translated back into community programming through Cooperative Extension and serve to inform the Pennsylvania legislature through reports to the Center for Rural Pennsylvania.

Sources of Funding: Hatch Act and State appropriated funds.

Scope of Impact: State Specific

Planned Program: Citizen's Views of Current Public Issues (PEN03876 – Willits)

Key Themes: Impact of Change on Rural Communities; Land Use; Jobs/Employment

Brief Description: This planned program, which has been ongoing for over 17 years, is continuing to assess how the personal, social, and locational characteristics of people are related to their perceptions and attitudes on issues facing their respective states, communities, and membership groups. Information derived from this planned program helps decision makers, planners, and managers understand and respond to the needs, values, and perceptions of the public and their constituents. It will also allow extension educators and teachers to focus their efforts on topics of interest and concern to their clients.

Impact/Accomplishment Statement: Data from a 2002 statewide survey of Pennsylvania residents were compared to similar data collected in 1980, 1990, and 2001 to assess changes in the views of citizens concerning various issues facing their communities and state. The primary citizen concerns have remained stable in rural Pennsylvania, with the top priorities being crime and violence, health care, education, and care for the elderly. In the post-September 11 survey, rural resident concern over job availability increased, but other priorities did not shift. A survey of Pennsylvania residents comparing responses in rural (population densities below the median Pennsylvania density) and non-rural areas documented that, while an overwhelming majority of Pennsylvania residents expressed a desire to preserve farmland and open space and to conserve environmental resources, these opinions were most strongly held in rural areas of Pennsylvania threatened by urban sprawl. A report of these findings, which reinforced previous survey results that rural Pennsylvanians are very concerned about job loss and availability of health care, was provided to the Pennsylvania state legislature. Finally, a survey to examine

how urban ethnic populations perceive parks and open space revealed substantial variation in the specific attributes sought by African American, Hispanic, Chinese, Korean, Japanese, and Caucasian respondents. These results will assist decisions about the type of amenities (e.g., recreational facilities vs. wilderness attributes and wildlife) that should be offered in parks. The U.S. Forest Service has provided these results to urban foresters through USFS urban recreation policy.

Sources of Funding: Hatch Act and State appropriated funds.

Scope of Impact: State Specific

Stakeholder Input Process: We continue to rely upon the close interactions between the Agricultural Experiment Station and Cooperative Extension as a primary source of stakeholder input. Approximately one half of the faculty, staff, and administrators on the University Park campus supported by research funding have split appointments in research and extension. These connections help to ensure that our research enterprise is informed by the needs of end users of our knowledge generation. Details of the Cooperative Extension processes for stakeholder listening are available in the Penn State Cooperative Extension FY2000-04 Plan of Work and the Penn State Cooperative Extension Annual Report of Accomplishments and Results FY2000, FY2001, FY2002, FY2003, FY2004, FY2005, and FY2006.

Representatives of the Pennsylvania Agricultural Experiment Station also interact directly with stakeholders, providing them with the opportunity to comment directly on research priorities. The Pennsylvania Agricultural Experiment Station Research Plan of Work FY2000-04 provides a list of stakeholder groups and events that provide such feedback. Examples within FY2006 include state-wide or regional meetings of the Pennsylvania Farm Bureau, PennAg Industries, the State Horticultural Association of Pennsylvania, the Pennsylvania Agronomic Education Society, the Pennsylvania Association for Sustainable Agriculture, the Pennsylvania Christmas Tree Growers Association, the Pennsylvania Landscape and Nursery Association, and the Pennsylvania Floral Industry Association, among many others. We also have direct connections with the Penn State Agricultural Council (http://agcouncil.cas.psu.edu) and, through the council, the approximately 100 member organizations and groups representing the agricultural industry across Pennsylvania. Our discussions with stakeholders have influenced budget priorities, with regards to both faculty/staff positions and program funds, and the strategic planning process.

Stakeholders continued to provide input in identifying emerging issues that require new or innovative research. Our commitment to organic agriculture production is an example of this. In addition to our certified organic apple orchard at our Fruit Research and Extension Center in Biglerville, Pennsylvania, we have land at our Russell E. Larson Agricultural Research Center near our main campus in transition to organic agronomic crops, have a Concord juice grape vineyard in transition to organic at our Lake Erie Grape Research and Extension Center in North East, Pennsylvania, and are working on organic vegetable production in high tunnels near the main Penn State campus. We maintain our joint experiments on weed management in organic crop production systems in eastern Pennsylvania with the Rodale Institute. None of these efforts have led to a diminution of effort on conventional agriculture, but all efforts have informed our understanding and recommendations in both conventional and organic settings. The Hatch-supported science on organic transition is driven by interest from our stakeholders. The apple effort involves both growers and a grower-owned cooperative processing facility. The grape effort results from interest by a grower-owned processing cooperative.

Program Review Process: There have been no significant changes in the Merit and Peer Review processes during FY2006 as stated in the Research Plan of Work for the Pennsylvania Agricultural Experiment Station for Federal Fiscal Years 2000 to 2004.

Evaluation of the Success of Multi and Joint Activities:

Multistate Activities: Collaborative research is an important mechanism for expanding the capacity of our Agricultural Experiment Station researchers. Our faculty participated in 41 multistate projects in FY2006. In addition, Penn State researchers regularly engage in collaborative efforts with research colleagues in other states, primarily through the process of obtaining external funding leveraged by Hatch Funds. Several USDA Competitive Grants programs have placed an emphasis on such collaborative research, and our faculty have responded enthusiastically to these opportunities. Many of these efforts are regional in nature, reflecting shared agricultural research priorities, but a number of the collaborations are national and international.

Integrated Activities: The Pennsylvania Agricultural Experiment Station has a commitment to working with Penn State Cooperative Extension and Resident Education to fully integrate the research enterprise with other functions within the College of Agricultural Sciences and the University. Nearly all of our faculty have joint appointments that cross the research, cooperative extension, and resident education functions, and this is reflected in our eight new faculty added to the Experiment Station in FY2006. This integration of appointment helps to ensure that all clientele receive the benefit of the latest research information generated here at Penn State and beyond.

Multidisciplinary Activities: Nearly all of the research activities conducted by the Pennsylvania Agricultural Experiment Station are multidisciplinary in nature. In FY2006 the College of Agricultural Sciences, of which the Experiment Station is the research enterprise, contributed to Social Sciences research, Life Sciences research, research in the Children, Youth, and Families Consortium, and to Environmental research, all of which are university-wide multidisciplinary initiatives.

The planned multi and joint activities conducted by the Pennsylvania Agricultural Experiment Station addressed issues that have been identified through the multistate activities planning process (multistate projects) and through needs assessments in collaboration with cooperative extension and/or resident education faculty and audiences. The relevance of these activities to the five USDA goals has been noted in the previous sections. In addition, multi and joint activities are conducted in the framework of the College of Agricultural Sciences three-year strategic plan (http://www.cas.psu.edu/docs/StrategicPlanning/PDFs/StrategicPlanDraft05.pdf), which identifies areas of critical issues at the state level. The College strategic priorities determine our faculty hires and program fund allocations for each of these issue areas, and faculty develop their Hatch and multistate projects on the basis of these critical issues.

Focus on underserved populations has long been a specific goal of our research. A project highlighted under Goal 5 has examined the relationship of family structure, especially female-headed and multigenerational families, to poverty levels and reliance on social services. These factors are particularly poorly understood in non-metro Hispanic families, and families in this demographic have been a specific target of this research. Given the increase in the Pennsylvania Hispanic population, the importance of Hispanics to the agricultural and rural labor pool, and the current debates over immigration policy and language, this research is already being used by Cooperative Extension educators to design programming that reaches both this particular audience and the local municipal decision-makers who must administer many of the social programs. Our focus on women in agriculture continued to be one of the major growth programs in our portfolio. A combination of in-depth interviews and focus groups has contributed to the identification of networking strategies that increase knowledge sharing among participants, especially on topics of sustainable agriculture and non-commodity based marketing strategies. These are topics of particular interest according to the women involved in the research.

All of our planned programs list expected outcomes or impacts of the research, and our multi and joint activities are no exception to this. Research activities funded via competitive grants are generally required to include outcomes and impacts as part of the application process. The evaluation of these proposals routinely includes consideration of the relevance of the research as measured by these expected outcomes.

Joint and multi-activity planned programs report annually on impact, which measures program effectiveness. For example, the women in agriculture project mentioned above almost immediately translated research results back into extension programming that enabled the desired knowledge exchange to begin. Our research on modeling the epidemiology of soybean rust was estimated by the Economic Research Service to have increased soybean growers' profits by $11-299 million in 2005 at an implementaion cost of $2.6-5 million. Further, the success of information technology (IT) applications for soybean rust have led to a partnership with USDA (APHIS and RMA) to develop a version of the IT system used in soybean rust that can be adapted to other high consequence pests. Research on area-wide pest management in apples based upon mating disruption using insect pheromones and reduced pesticide levels was immediately communicated back to the grower community by extension. The result is that, in 2006, over 2,000 acres of Pennsylvania orchards were being treated for oriental fruit moth using mating disruption, and nearly that much acreage was under mating disruption management for codling moth and a variety of other fruit-boring caterpillar pests. This translates to a significant reduction in pounds of active ingredients applied to fruit production operations.

Integrated Research and Extension Activities: Of the 532 administrators, faculty, and staff at University Park who are supported with research funds, 255 have split research and extension appointments. Funds supporting this research portion of these positions account for the appropriated dollars indicated on the first line on Form CSREES-REPT. The dollars indicated on this line are the result of personnel with a research and extension joint appointment, where the research portion is paid on Hatch or Multistate Hatch funds.

[1]The resources indicated in this document are based on FY2006 expenditures and do not include fringe benefits or University overhead.

United States 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 and Integrated Activities
(Attach Brief Summaries)

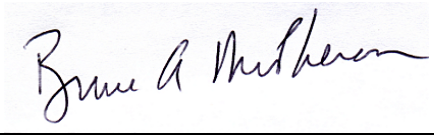
Fiscal Year: 2006

Select One: □ **Interim** X **Final**

Institution: **Pennsylvania AES** **State: PA**

	Integrated Activities (Hatch)	Multistate Extension Activities (Smith-Lever)	Integrated Activities (Smith-Lever)
Established Target Percentage	25%	%	%
This FY Allocation (from 1088)	$4,524,167	$	$
This FY Target Amount	$1,131,042	$	$
Carryover Previously Reported	$450,985	$	$
Title of Planned Program Activity			
Joint Research & Extension Personnel Appointments	$1,591,496	$	$
Total	$1,591,496	$	$
Carryover	$911,439	$	$

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.



Director **Date**

Form CSREES-REPT (Revised 09/04)