

# RESEARCH PLAN OF WORK

for the  
Pennsylvania Agricultural Experiment Station

at  
The Pennsylvania State University

PENNSSTATE



**College of Agricultural Sciences**

Federal Fiscal Years  
2000 to 2004

# Research Plan of Work for the Pennsylvania Agricultural Experiment Station at the Pennsylvania State University

**Introduction:**

The Pennsylvania Agricultural Experiment Station is part of the College of Agricultural Sciences at The Pennsylvania State University, which is located in University Park, Pennsylvania. The Experiment Station has research activities in the areas of agriculture and food systems, natural resources and environment, and economic and social well being.

This Plan of Work is a comprehensive statement of research activities performed under the Hatch Act, and is proposed for the next five years, as required by the Agricultural Research, Extension, and Education Reform Act of 1998 (ARRERA) and as allowed under the USDA's "Guidelines for Land Grant Institution Plan of Work." Much of the present Plan of Work is based on the current College of Agricultural Sciences' Strategic Plan (Appendix A) which was developed with the goal of assuring strong integration among the teaching, research, and cooperative extension functions of the College.

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**Planned Programs:**

Under this section, we will provide general information on all projects within a goal, and additionally, will provide examples of one or more individual projects within each goal to illustrate the POW process.

Function	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
1862 Research	See listing of all projects relating to this area at the end of Goal 1.	See listing of all projects relating to this area at the end of Goal 2.	See listing of all projects relating to this area at the end of Goal 3.	See listing of all projects relating to this area at the end of Goal 4.	See listing of all projects relating to this area at the end of Goal 5.

## **Goal 1: An agricultural system that is highly competitive in the global economy.**

### **Issue(s):**

America's agriculture, food, and forestry sectors are increasingly challenged by international and national competitive forces that influence prices to producers and processors. Pennsylvania must have access to the latest technologies to manage their input costs, to market effectively, and ultimately to profit in the local, national, and international market places. This will require not only that Penn State produce research information for Pennsylvania's unique environments, but also that it makes state-of-the-art research information available in a timely and user-friendly manner. All of the identified issues contain short-, intermediate-, and long-term components. The stakeholder process detailed on page ~~##~~26 in the "Stakeholder Input" section was utilized for the identification of these issues.

### **Performance Goal(s):**

Enhance market share for Pennsylvania agriculture, food and forest products as well as for Pennsylvania processed products

### **Output Indicators:**

1. Value of agricultural and forestry commodities
2. Value of processed agriculture and food products
3. Value of Pennsylvania-based agricultural exports

### **Outcome Indicators:**

1. Increased profitability for Pennsylvania agriculture and forestry products
2. Increased exports of Pennsylvania commodities and processed products

### **Key Program Component(s):**

Research projects will focus on:

1. Developing new technologies for enhanced profitability of Pennsylvania farm and forest operations;
2. Support of Pennsylvania's processing industry for enhanced utilization of Pennsylvania produced agricultural and forestry products; and
3. Support of developing niche market entrepreneurs.

### **Internal and External Linkages:**

Penn State will continue linkages with extension, other educational institutions, state and federal agencies, industries, foundations, and international centers and/or universities (see Appendix B). We will continue to work with the Penn State Intellectual Property Office to identify emerging technologies for licensing and/or patent development. As emerging relationships develop with other universities and federal partners and as they progress to formal linkages, they will be reported in the annual reporting process.

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**Target Audiences:**

Target audiences will include producers of agricultural and forest commodities, agriculture and forestry related industries, and underserved populations that include the small and part-time farmer and rural poor. Additionally, we will assist the niche marketer, such as the organic farmer.

**Program Duration:**

This program of approximately 163 projects will continue for five years.

**Allocated Resources from ALL appropriated sources directed to Goal 1 (\$ in thousands):<sup>1</sup>**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
\$14,494	\$14,784	\$15,080	\$15,381	\$15,689	\$16,003

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition to the appropriations indicated in the table above, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations.

**Allocated SYs to Goal 1 (in units):**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
96.12	96.12	96.12	96.12	96.12	96.12

**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.** It is intended that we would report not only scholarly output, but also linkages into the programmatic area; partnering across the college, region, and beyond; leveraging of additional resources; and impact on stakeholders.

**3626 - ROOTSTOCK AND INTERSTEM EFFECTS ON POME- AND STONE-FRUIT TREES**

**OBJECTIVES:** To evaluate the performance of pome and stone fruit rootstocks in various environments and under different management systems.

**APPROACH:** To evaluate improved rootstock material and climatic and edaphic factors as related to tree performance, present replicated and randomized uniform plantings will be maintained, and new plantings will be established. Promising new and existing rootstocks and interstems have been or will be selected. They will be evaluated with respect to precocity, productivity, size control, anchorage, suckering, pest resistance, adaptability, and production efficiency. Studies will be conducted to evaluate the performance of various orchard management systems, including different cultivars on new and existing rootstocks and interstems.

**3625 - MANAGEMENT SYSTEMS FOR IMPROVED DECISION MAKING AND PROFITABILITY OF DAIRY HERDS**

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**OBJECTIVES:** Develop and integrate decision support to promote efficient, environmentally sound, and economically viable management systems for dairy youngstock. Develop and integrate decision support systems to optimize productive and economic efficiencies for lactating and dry cow management systems.

**APPROACH:** The approach will be to determine factors affecting profitability of the heifer enterprise and develop tools to compare alternative strategies of raising heifers. Define the relationships among required nutrients for optimal economic performance of growing dairy heifers. Establish inter-relationships of calf and heifer morbidity, growth, age at first calving, and lifetime productivity for optimal calf and heifer management. Further aspects of the project will be to study nutritional management strategies for dry and lactating dairy cows and study the effect of environment and management strategies on dairy cow health, comfort, performance, and well-being.

### **3550 - DEVELOPMENT OF A GENETIC TRANSFORMATION SYSTEM FOR THEOBROMA CACAO L. (CACAO)**

**OBJECTIVES:** Develop an Agrobacterium based transformation system for cacao. Develop a biolistic transformation system using somatic embryos of cacao. Develop selectable and visible marker genes for transformation of cacao. Perform molecular and genetic tests of transgenic plants.

**APPROACH:** A series of experiments are planned which will seek to optimize conditions for DNA delivery and transgenic plant regeneration for cacao. We will focus on somatic embryogenesis as a source of tissues for particle gun bombardment experiments. We will also investigate the possibility of using Agrobacterium tumefaciens as a transformation agent. We will test several different selectable and visible marker genes in various combinations in order to find the most efficient combination for selection and identification of transgenic tissues and plants. Western, Southern, Northern and histochemical analysis will be done to determine the status of introduced DNA, and its expression patterns.

**Listing of other Penn State Projects with primary activity within Goal 1:** *For further information on any of the following projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

- 1606 POULTRY DIAGNOSTIC LABORATORY
- 1607 LABORATORY FOR DIAGNOSING DISEASES OF LIVESTOCK
- 1845 INTERNATIONAL AGRICULTURAL PROGRAMS
- 3330 IMPROVING THE ECONOMIC STATUS OF WOMEN AND THE NUTRITION ON INFANTS AND CHILDREN IN KENYA
- 3350 BIOCHEMISTRY OF BIORATIONAL PESTICIDES-BACILLUS THURINGIENSIS AND BACULOVIRUSES
- 3382 INTEGRATED CROP/PEST MANAGEMENT FOR GREENHOUSE PRODUCTION
- 3390 BIOLOGY, MYCOTOXICOLOGY, GENETICS OF TOXIN PRODUCTION AND TAXONOMY OF THE GENUS FUSARIUM
- 3395 GENETIC RELATIONSHIPS OF GROWTH AND REPRODUCTION IN DIVERSE POULTRY POPULATIONS

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- 3396 STUDIES OF THE ETIOLOGY, PATHOGENESIS, & CONTROL OF INFECTIOUS DISEASES OF POULTRY IN PENNSYLVANIA
- 3397 FUNCTION OF MYCORRHIZAL MYCELIAL NETWORKS IN SOIL
- 3399 DETERMINING THE EFFICACY AND CROP TOLERANCE OF HERBICIDES USED IN ORNAMENTALS AND RIGHT-OF-WAYS
- 3402 INTEGRATED PEST MANAGEMENT APPROACHES AND INFORMATION SYSTEMS FOR DECIDUOUS TREE FRUITS
- 3403 REGULATION OF MEAT ANIMAL GROWTH BY SOMATOTROPIN
- 3404 SOLVENT-KRAFT PULP AND PAPERMAKING PROPERTIES OF NORTHEASTERN HARDWOODS
- 3407 IDENTIFICATION AND EVALUATION OF ALTERNATIVE METHODS FOR MUSHROOM FARMING
- 3409 ROLE OF GROWTH HORMONE (GH) IN GROWTH AND METABOLISM OF DOMESTIC POULTRY
- 3411 IMPACT OF VARIABLE FOOD QUALITY ON GYPSY MOTH-INFLUENCED SYSTEMS
- 3412 MOLECULAR REGULATION AND BIOCHEMISTRY DURING MOLTING AND IMMUNE DEFENSE: TARGETING INSECT PESTS
- 3419 ASSURING PALATABILITY OF LOW FAT MEAT PRODUCTS
- 3420 EFFECTS OF LACTOGENIC HORMONES ON MILK PRODUCTION AND NEONATAL DEVELOPMENT IN SWINE
- 3422 BYPRODUCT AND FORAGE FEEDING SYSTEMS FOR ENHANCING LIVESTOCK PRODUCTION
- 3423 INSULIN-LIKE GROWTH FACTOR SYSTEM AFFECTING MAMMARY EPITHELIAL CELL GROWTH AND DEVELOPMENT
- 3424 MOLECULAR EFFECTORS OF RED BLOOD CELL DEVELOPMENT IN NORMAL, DISEASED, AND TRANSFORMED CONDITIONS
- 3425 FACTORS AFFECTING MEAT PRODUCTION AND CARCASS YIELD OF BROILERS AND TURKEYS
- 3436 GENETICS AND REGENERATION OF NORTHERN RED OAK AND OTHER PENNSYLVANIA HARDWOODS
- 3437 COLONIZATION OF OAK STANDS BY HAY-SCENTED FERN
- 3443 BIOLOGICAL AND CULTURAL MANAGEMENT OF PLANT-PARASITIC NEMATODES
- 3445 BIOPHYSICAL MODELS FOR POULTRY PRODUCTION SYSTEMS
- 3446 ENVIRONMENTAL AND ECONOMIC IMPACTS OF NUTRIENT FLOWS IN DAIRY FORAGE SYSTEMS
- 3448 GENETIC MANIPULATION OF SWEET CORN QUALITY AND STRESS RESISTANCE
- 3449 INTEGRATING COVER CROPS, CULTIVATION AND HERBICIDES TO OPTIMIZE WEED CONTROL
- 3450 MULTIDISCIPLINARY EVALUATION OF NEW APPLE CULTIVARS
- 3451 A QUANTITATIVE MODEL OF PENNSYLVANIA'S AGRICULTURAL ECONOMY
- 3452 GENETIC AND NON-GENETIC ASPECTS OF LAMB AND WOOL PRODUCTION IN U.S. SHEEP BREEDS
- 3453 STRATEGIES TO MANAGE POTATO INSECT PESTS, OPTIMIZE INSECTICIDE USAGE AND REDUCE RESISTANCE

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- 3454 CAUSES, FACTORS AFFECTING DEVELOPMENT, AND EFFECTS OF DISEASES ON CONIFER REGENERATION
- 3456 ENDOCRINE, AUTOCRINE AND PARACRINE CONTROL OF LONGITUDINAL BONE GROWTH
- 3457 BIOLOGY OF PYTHIUM ROOT ROT
- 3458 PHYSIOLOGICAL EFFICIENCY OF PHOSPHORUS ACQUISITION BY PLANT ROOT SYSTEMS
- 3460 CONSTITUTIVE & INDUCIBLE ROOT-SPECIFIC METABOLISM: REGULATION, METABOLIC COST, & BIO-SIGNIFICANCE
- 3462 MECHANISMS OF BONE RESORPTION IN POULTRY
- 3463 INSECT ECOLOGICAL GENETICS IN PEST MANAGEMENT
- 3465 MATERIAL CHARACTERIZATION OF LAMINATED VENEER LUMBER AND OTHER LUMBER COMPOSITES
- 3466 REGULATION OF TESTICULAR FUNCTION AND GROWTH IN ANIMALS
- 3467 DEVELOPMENT OF NEW TECHNOLOGY AND STRATEGIES TO INCREASE MUSHROOM PRODUCTION AND QUALITY
- 3468 ENVIRONMENTAL MODIFICATION FOR EXTENDED VEGETABLE PRODUCTION
- 3469 BERRY CULTURE AND PHYSIOLOGY WITH EMPHASIS ON BELOW GROUND PHENOMENA
- 3472 VALUE-ADDED STRUCTURAL APPLICATIONS FOR WOOD
- 3474 USING TREE-RING ANALYSIS TO UNDERSTAND THE ONSET AND PROGRESSION OF FOREST TREE DECLINE
- 3476 INTEGRATED WEED MANAGEMENT FOR AGRONOMIC CROPS
- 3477 ETHYLENE IN SENESCENCE, ABSCISSION, AND POST-POLLINATION RESPONSES OF FLOWERS
- 3478 SAMPLING AND EVALUATING IMPROVED HYBRIDS FOR CORN SILAGE PRODUCTION
- 3480 REGULATION OF GAMETE PHYSIOLOGY, FERTILIZATION AND EARLY EMBRYO DEVELOPMENT
- 3482 TURFGRASS WEED CONTROL AND GROWTH RETARDATION
- 3483 GERMPLASM ENHANCEMENT, BREEDING, AND GENETICS OF TURF AND NATIVE GRASSES
- 3484 PESTICIDE DETOXIFICATION MECHANISMS OF MICROORGANISMS
- 3486 ROOT BIOLOGY, PHYSIOLOGY, AND ECOLOGY IN APPLE AND OTHER WOODY SPECIES
- 3488 MECHANICS AND PROPERTIES OF PARTICULATE MATERIALS
- 3489 TURFGRASS FERTILITY AND TISSUE TESTING
- 3492 BIOCOPLEXITY IN POULTRY MANAGEMENT SYSTEMS
- 3495 ECOLOGICAL INTERACTIONS IN THE DIABROTICITE TRANSMISSION OF ERWINA TRACHEIPHILA
- 3497 CHEMOSENSORY BASIS FOR POLLINIVORY (POLLEN-FEEDING) IN DIABROTICITES
- 3499 ROLE OF HARDWOOD BARK MULCH SUBSTRATE ON THE LIFE CYCLE OF ARTILLERY FUNGUS
- 3500 HORMONAL REGULATION OF ADVENTITIOUS ROOT FORMATION IN CUTTINGS

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- 3502 DISEASE MANAGEMENT IN POME AND STONE FRUIT ORCHARDS IN PENNSYLVANIA
- 3503 BIOLOGY OF POTATO PATHOGENS AND DEVELOPMENT OF DISEASE RESISTANT CULTIVARS
- 3506 IMPROVEMENT OF THERMAL PROCESSES FOR FOODS
- 3507 REGULATORY MECHANISMS INVOLVED IN PLANT GROWTH, DEVELOPMENT, AND SECONDARY METABOLITE PRODUCTION
- 3508 INTEGRATED DISEASE MANAGEMENT STRATEGIES IN GRAPES AND APPLES
- 3510 PUBLIC EDUC & PERCEPTIONS ON ANIMAL AG: ENVIRONMENT FOOD SAFETY, ANIMAL WELL-BEING & SUSTAINABILITY
- 3511 ANIMAL HANDLING/TRANSPORTATION METHODS: PERCEPTIONS, ANIMAL WELL-BEING, ECONOMICS
- 3512 ENHANCING HEALTH, GROWTH AND PROFITABILITY OF BEEF, DAIRY, AND VEAL CALVES
- 3513 ECOLOGY AND MANAGEMENT OF EUROPEAN CORN BORER AND OTHER STALK-BORING LEPIDOPTERA
- 3516 REGULATION OF NUTRIENT USE IN FOOD-PRODUCING ANIMALS
- 3518 EVALUATION OF SOYBEAN GERMPLASM AND MANAGEMENT UNDER PENNSYLVANIA CONDITIONS
- 3519 MANAGEMENT OF BLIGHT AND ANTHRACNOSE EPIDEMICS IN TOMATO AND POTATO CROPS
- 3520 COMPARTMENTATION OF STARCH BIOSYNTHESIS IN MAIZE ENDOSPERM: AMYLOPLAST MEMBRANE TRANSPORTERS
- 3521 ARTIFICIAL INTELLIGENCE-BASED MODELING OF NATURAL AND MANAGED SYSTEMS
- 3522 ECOLOGY AND MANAGEMENT OF ARTHROPODS AFFECTING GRAPES
- 3523 ASSESSMENT AND SYSTEMATICS OF ARTHROPOD BIODIVERSITY
- 3524 ANTIOXIDANT EFFECTS ON PROSTAGLANDIN METABOLISM, LIPID PEROXIDATION AND IMMUNOLOGIC DEFENSE
- 3525 GRAZING SYSTEMS TO INCREASE PROFITABILITY AND SUSTAINABILITY OF BEEF PRODUCTION
- 3528 THE ROLE OF RISK IN THE SELECTION OF CROPS AND CROPPING SYSTEMS IN PENNSYLVANIA
- 3532 INTEGRATED PEST MANAGEMENT OF FORAGE INSECT PESTS
- 3533 SUSTAINABILITY AND PROFITABILITY OF PASTURE BASED DAIRY FORAGE SYSTEMS
- 3535 PESTICIDE ALTERNATIVES FOR CUCUMBER BEETLES AND BACTERIAL WILT
- 3538 EFFECT OF LOW IMPACT CONTROL MEASURES ON THE INCIDENCE AND IMPACT OF EARLY BLIGHT ON TOMATO PLANTS
- 3539 FACTORS AFFECTING REPRODUCTIVE EFFICIENCY OF SWINE
- 3540 THE IMPACT OF GENETIC, IMMUNE, AND ENDOCRINE INTERACTIONS IN CONTROLLING POULTRY PERFORMANCE
- 3546 LUTEOVIRUS - APHID VECTOR INTERACTIONS REGULATING VIRUS TRANSMISSION SPECIFICITY
- 3547 INTERACTIONS AMONG BEHAVIOR, PHYSIOLOGY, SOCIAL ORGANIZATION, AND DISEASE TRANSMISSION IN HONEY BEES



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- 3550 DEVELOPMENT OF A GENETIC TRANSFORMATION SYSTEM FOR THEOBROMA CACAO L. (CACAO)
- 3553 EFFECT OF OVIDUCT FLUID COMPOSITION ON SPERM MOTILITY AND CAPACITATION
- 3556 HOSTPLANT INCOMPATIBILITY WITH BIOLOGICAL CONTROL: TANNINS, BT, AND THE GYPSY MOTH
- 3558 USE OF MIDGUT EPITHELIAL CELLS TO ELUCIDATE BT RESISTANCE IN SPODOPTERA EXIGUA
- 3559 DEVELOPING IMPROVED FORAGE MANAGEMENT SYSTEMS FOR PENNSYLVANIA
- 3560 DEVELOPING NUTRITIONAL-MANAGEMENT PROTOCOLS WHICH PREVENT TIBIAL DYSCHONDROPLASIA
- 3562 TRANSCRIPTIONAL REGULATION OF FATTY ACID SYNTHASE GENE BY SOMATOTROPIN
- 3563 IDENTIFICATION OF STAPHYLOCOCCUS AUREUS VIRULENCE FACTORS ASSOCIATED WITH BOVINE MASTITIS
- 3566 ASSOCIATION OF FERTILITY WITH TEMPORAL CHANGES IN OVARIAN FUNCTION OF DOMESTIC RUMINANTS
- 3568 GENETIC AND BIOLOGICAL CHARACTERIZATION OF TRICHODERMA ASSOCIATED WITH AGARICUS BISPORUS
- 3569 GENETIC BASIS OF SEVERAL TRAITS IN PELARGONIUM XDOMESTICUM
- 3574 IMMUNOCONTRACEPTION OF WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS)
- 3575 DEVELOPMENT OF NEW POTATO CLONES FOR ENVIRONMENTAL & ECONOMICAL SUSTAINABILITY IN THE NORTHEAST
- 3576 SUSTAINABILITY OF PENNSYLVANIA'S FOREST RESOURCES
- 3578 SOIL AMENDMENTS FOR ATHLETIC FIELDS AND INTEGRATED DISEASE MANAGEMENT FOR TURFGRASSES
- 3579 PHYSIOLOGY OF STRESS TOLERANCE MECHANISMS IN TURFGRASSES
- 3580 PRODUCTION & CHARACTERIZATION OF EXOPOLYSACCHARIDES BY LACTOBACILLUS DELBRUECKII SSP. BULGARICUS
- 3585 INTEGRATED MANAGEMENT OF ARTHROPOD PESTS OF LIVESTOCK AND POULTRY
- 3591 CENTER FOR FOOD MANUFACTURING
- 3593 VEGETABLE DISEASE MANAGEMENT
- 3594 BREEDING AND GENETICS OF SMALL GRAINS
- 3596 MANAGEMENT OF ARTHROPOD PESTS IN PENNSYLVANIA FORESTS AND THRIPS IN GREENHOUSES
- 3597 STARCH BIOSYNTHESIS IN CROP PLANTS
- 3598 CHARACTERIZATION OF EMBP-1: A PLANT BZIP TRANSCRIPTION FACTOR
- 3599 USE OF ENVIRONMENTALLY FRIENDLY ORGANIC COMPOUNDS TO IMPROVE PROPERTIES OF WOOD CEMENT COMPOSITES
- 3600 ECOLOGY, POPULATION BIOLOGY, AND MANAGEMENT OF INSECTS ATTACKING FIELD AND SWEET CORN
- 3602 MONITORING, MAPPING, AND MANAGEMENT OF INSECTS AFFECTING VEGETABLE CROPS
- 3604 MECHANISMS OF ENDOTHELIAL CELL DYSFUNCTION DURING SELENIUM DEFICIENCY

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- 3605 CHEMOSENSORY REGULATION OF PHYTOPHAGOUS INSECT FEEDING
- 3606 PENN STATE RESEARCH ON SOYBEAN OIL (EFFECTS OF TREE PHYSIOLOGY, PEST CONTROL, AND STORAGE LIFE)
- 3607 TOWARDS A BETTER UNDERSTANDING OF ROOT LIFESPAN: ROOT PROLIFERATION AND ROOT HERBIVORY
- 3609 GERMPLASM ANALYSIS, ENHANCEMENT AND CULTURE OF EDIBLE MUSHROOMS
- 3612 ROOT ARCHITECTURE AND PHOSPHORUS ACQUISITION EFFICIENCY: AN INTERDISCIPLINARY APPROACH
- 3613 MALE FACTORS AFFECTING FERTILITY OF BOVINE SPERM
- 3614 MOLECULAR TAGGING OF GENES CONFERRING EARLY BLIGHT RESISTANCE IN TOMATO
- 3615 THE ROLE OF UNCERTAINTY IN AGRICULTURAL COMMODITY PRICES
- 3616 IMPROVING PENNSYLVANIA DAIRY FARM PROFITABILITY (FY 1997)
- 3617 TECHNOLOGY AND PRINCIPLES FOR ASSESSING AND RETAINING POSTHARVEST QUALITY OF FRUITS AND VEGETABLES
- 3619 PRECISION IPM AND MONITORING NETWORKS IN NORTHEASTERN VEGETABLE CROPS
- 3620 METABOLIC RELATIONSHIPS IN SUPPLY OF NUTRIENTS FOR LACTATING COWS
- 3624 MASTITIS RESISTANCE TO ENHANCE DAIRY FOOD SAFETY
- 3625 ~~MANAGEMENT~~ **MANAGEMENT** SYSTEMS FOR IMPROVED DECISION MAKING AND PROFITABILITY OF DAIRY HERDS
- 3626 ROOTSTOCK AND INTERSTEM EFFECTS ON POME- AND STONE-FRUIT TREES
- 3627 REGULATION OF PHOTOSYNTHETIC PROCESSES
- 3628 ENTERIC DISEASES OF SWINE AND CATTLE: PREVENTION, CONTROL, AND FOOD SAFETY
- 3632 SIGNALS INVOLVED IN ARABIDOPSIS RESPONSE TO PHOSPHORUS STARVATION
- 3633 MOLECULAR BASES FOR SELECTIVE CHEMISTRY IN INTEGRATED MANAGEMENT OF ARTHROPOD PESTS
- 3634 DIVERGENT SELECTION FOR EXPONENTIAL GROWTH RATE AT DIFFERENT AGES IN GROWING CHICKENS
- 3637 E-PROTEIN MODIFICATION AS A MYOGENIC REGULATORY MECHANISM
- 3638 MONOGRAPHIC STUDIES OF HYPOCREALEAN FUNGI: HYPOCREA AND HYPOMYCES
- 3640 IMPROVING FARMERS ACCESS TO PEST MANAGEMENT TOOLS THROUGH INTEGRATION WITH THE NII
- 3642 IMPROVING THE HEALTH AND PRODUCTIVITY OF HONEY BEE COLONIES
- 3643 FOURTH INTERNATIONAL WORKSHOP ON LACTATION IN FARM ANIMALS
- 3645 GENETIC ENHANCEMENT OF HEALTH AND SURVIVAL FOR DAIRY CATTLE
- 3646 DENDROECOLOGICAL AND SUCCESSIONAL ATTRIBUTES OF OLD-GROWTH AND SECOND-GROWTH MIXED-OAK & CONIFER FORESTS
- 3648 THE PENN STATE FY 1998 MILK SAFETY PROGRAM
- 3649 SUPPORT FOR THE 12TH ANNUAL PENN STATE SYMPOSIUM IN PLANT PHYSIOLOGY
- 3650 NUTRIENT DETERMINATION AND MANAGEMENT OF BY-PRODUCTS OF POULTRY PRODUCTION

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- 3652 SPECIFICITY AND VARIABILITY OF HOST-PATHOGEN INTERACTIONS IN THE RICE BLAST SYSTEM
- 3653 DISEASE RESISTANCE IN CORN
- 3655 DEVELOPMENT AND EVALUATION OF POTATO CULTIVARS WITH DISEASE RESISTANCE
- 3657 CHARACTERIZATION OF PHOSPHOREGULATORY MECHANISMS GOVERNING AVIAN MYOGENESIS
- 3660 GROWTH-HORMONE JAK2 SIGNALLING IN CHICKENS: PATHWAYS FOR MUSCLE GROWTH
- 3662 UTILIZATION OF SPENT MUSHROOM AND OTHER COMPOSTS AS AMENDMENTS FOR GREENHOUSE AND NURSERY MEDIA
- 3663 MECHANISMS OF MULTIPLE VIRULENCE CHANGES IN THE RICE BLAST FUNGUS *MAGNAPORTHE ORYZAE*
- 3665 BIOLOGICALLY BASED PEST MANAGEMENT FOR COOL-SEASON TURFGRASS ARTHROPOD PESTS
- 3667 GENETIC BASES FOR RESISTANCE AND IMMUNITY TO AVIAN DISEASES
- 3669 PRODUCTIVITY, INNOVATION, AND GLOBALIZATION
- 3670 IMPROVING PENNSYLVANIA DAIRY FARM PROFITABILITY FY 1998
- 3671 EVALUATING THE PERFORMANCE OF ORNAMENTAL FLOWERING PLANTS AND VEGETABLES
- 3672 DECISION SUPPORT FOR DESIGN AND CONTROL OF PLANT GROWTH SYSTEMS
- 3675 ANALYSIS OF THE MOLECULAR EVENTS REGULATING HEMATOPOIESIS

## **Goal 2: A safe and secure food and fiber system.**

### **Issue(s):**

Consumers frequently voice concerns over the safety of their food supply, while producers and processors lack the techniques and procedures to rapidly, inexpensively and accurately determine the safety of the products they produce. All of the identified issues contain short-, intermediate-, and long-term components. The stakeholder process detailed on page ~~##~~26 in the "Stakeholder Input" section was utilized for the identification of these issues.

### **Performance Goal(s):**

Increase availability of food products that are locally grown, transported, and processed with best management practices to reduce pests, residues, and pathogens while enhancing safety and food availability to the consuming public

### **Output Indicators:**

1. Rapid and assured detection methods for potential pathogens both on-farm and during processing
2. Research enhancements of production, processing, and storage techniques to assure retention of inherent food value and suppression or elimination of pathogen, pesticide, and other risk factors

### **Outcome Indicators:**

1. Increased access to fresh or high quality food to the citizens of Pennsylvania
2. Reduced consumer fears relating to pathogens or residues in food
3. Awareness of appropriate food safety procedures from production to consumption
4. Reduced malnutrition and food poisonings in the state of Pennsylvania

### **Key Program Component(s):**

Research programs will focus on:

1. Detection and remediation of food safety problems;
2. Improved pest management with safe biorational products to enhance safety; and
3. Developing improved transport, processing and marketing procedures to assure farm fresh quality.

### **Internal and External Linkages:**

Penn State will continue linkages with extension, other educational institutions, state and federal agencies, industries, foundations, and international centers and/or universities (see Appendix B). We will continue to work with the Penn State Intellectual Property Office to identify emerging technologies for licensing and/or patent development. As emerging relationships develop with other universities and federal partners and as they progress to formal linkages, they will be reported in the annual reporting process.

**Target Audiences:**

Research efforts will focus on the consumers of the state of Pennsylvania, while working with producers and processors to assure a safe and universally available food supply. Special attention will be paid to underserved or at-risk citizens when appropriate.

**Program Duration:**

This program of approximately 8 projects will continue for five years.

**Allocated Resources from ALL appropriated sources directed to Goal 2 (\$ in thousands):<sup>1</sup>**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
\$711	\$726	\$740	\$755	\$770	\$785

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition to the appropriations indicated in the table above, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations.

**Allocated SYs to Goal 2 (in units):**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
4.72	4.72	4.72	4.72	4.72	4.72

**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.** It is intended that we would report not only scholarly output, but also linkages into the programmatic area; partnering across the college, region, and beyond; leveraging of additional resources; and impact on stakeholders.

~~**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.**~~

**3494 - IMPROVEMENT IN QUALITY, SHELF-LIFE AND SAFETY OF CULTIVATED MUSHROOMS AND OTHER FUNGAL PRODUCTS**

**OBJECTIVES:** Develop cultural practices and postharvest handling and processing procedures to improve efficiency, yield, quality and safety of fresh and processed mushroom products. Evaluate the potential for producing valuable food and non-food products from cultivated mushrooms and other fungi.

**APPROACH:** Freshly harvested mushrooms from peak day of the first three flushes of each crop will be evaluated for selected characteristics important to processors. Fresh color, solids content and postharvest shelf-life will be evaluated and shrinkage which occurs during canning and color of the canned product will be determined by standard practices. The conventional (PVC wrapped) retail package for mushrooms will be altered into a modified atmosphere package, such that the optimum oxygen and carbon dioxide levels will be

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maintained through use of appropriate films. The use of microporous films (with a new technology), and film with increased permeability ratios and a reduced ratio of CO<sub>2</sub> to O<sub>2</sub> permeability will be evaluated. The gas compositions within the modified atmosphere-humidity packages will be analyzed over time with a gas chromatograph. A commercial relative humidity control system will also be incorporated within the modified atmosphere package. The preparation or manufacture of value-added food and non-food products from cultured mushrooms or other fungi will be investigated using appropriate technology. The use of yeasts to produce wine and bread are examples of food products to be investigated.

**Listing of other Penn State Projects with primary activity within Goal 2:** *For further information on any of the following projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

- 3356 MECHANISMS OF BACTERIAL OSMOREGULATION
- 3441 DETECTION & CONTROL OF FOODBORNE PATHOGENS THROUGH A BASIC UNDERSTANDING OF THEIR INJURY & REPAIR
- 3494 IMPROVEMENT IN QUALITY, SHELF-LIFE AND SAFETY OF CULTIVATED MUSHROOMS AND OTHER FUNGAL PRODUCTS
- 3514 FUSARIUM MYCOTOXINS IN CEREAL GRAINS
- 3537 THE PENN STATE FY 1996 MILK SAFETY RESEARCH PROGRAM
- 3583 AGRICULTURAL SAFETY AND HEALTH FOR FARM FAMILIES AND FARM WORKERS
- 3592 THE PENN STATE FY 1997 MILK SAFETY RESEARCH PROGRAM
- 3664 POSTHARVEST PHYSIOLOGY OF FRUITS

### **Goal 3: A healthy, well-nourished population.**

#### **Issue(s):**

Even in this time of ample food, residents of Pennsylvania and the Nation make choices on food and/or exercise that do not support healthy or well-nourished lifestyles. All of the identified issues contain short-, intermediate-, and long-term components. The stakeholder process detailed on page ~~##~~26 in the "Stakeholder Input" section was utilized for the identification of these issues.

#### **Performance Goal(s):**

1. Develop more nutritious foods based upon supplements, biotechnology, or improved processing techniques
2. Determine sociological and educational barriers to acceptance of healthy choices

#### **Output Indicators:**

1. Availability of nutrient enhanced foods to the general public
2. Understanding of rejection-acceptance criteria of healthy choices
3. Development of industry partnerships to assure marketing of superior food products

#### **Outcome Indicators:**

1. Increased access and acceptance of nutrient enhanced foods
2. Reduced incidence of malnutrition in Pennsylvania
3. Increase in people making positive decisions to improve diet or lifestyle

#### **Key Program Component(s):**

Research projects will focus on:

1. Enhancing nutritional status of Pennsylvania produced agricultural crops, meats and dairy products;
2. Improved understanding of healthy foods and lifestyle choices for Pennsylvania citizens; and
3. Reduction of nutrient losses in foods by developing better techniques for storage, preservation, and transportation.

#### **Internal and External Linkages:**

Penn State will continue linkages with extension, other educational institutions, state and federal agencies, industries, foundations, and international centers and/or universities (see Appendix B). We will continue to work with the Penn State Intellectual Property Office to identify emerging technologies for licensing and/or patent development. As emerging relationships develop with other universities and federal partners and as they progress to formal linkages, they will be reported in the annual reporting process.

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**Target Audiences:**

Research teams will focus on the consumers of the state of Pennsylvania, while working with producers and processors to assure availability and utilization of a nutritious food supply. Special attention will be paid to underserved or at-risk citizens when appropriate.

**Program Duration:**

This program of approximately 5 projects will continue for five years.

**Allocated Resources from ALL appropriated sources directed to Goal 3 (\$ in thousands):<sup>1</sup>**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
\$445	\$453	\$463	\$472	\$481	\$491

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition to the appropriations indicated in the table above, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations.

**Allocated SYs to Goal 3 (in units):**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
2.95	2.95	2.95	2.95	2.95	2.95

**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.** It is intended that we would report not only scholarly output, but also linkages into the programmatic area; partnering across the college, region, and beyond; leveraging of additional resources; and impact on stakeholders.

~~**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.**~~

**3610 - IDENTIFYING STRATEGIES FOR INCREASING CONFIDENCE IN THE U.S. FOOD SYSTEM**

**OBJECTIVES:** Identify factors underlying public attitudes on food safety. Identify segments of public with distinctive food safety attitudes. Identify education/information programs appropriate for each segment.

**APPROACH:** Focus group and in-depth interviews will be used to identify differences in trust in food system and broader socio-economic system. Nationwide consumer survey will investigate differences in food system trust and self-efficacy beliefs. Consumer respondents will be grouped in similar segments. Acceptability of different food safety information sources will be determined for each segment.

**3658 - EXAMINING FOOD ISSUES IN RESOURCE STRESSED FAMILIES, HOUSEHOLDS, AND COMMUNITIES**



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**OBJECTIVES:** Develop and assess alternative community approaches to increasing awareness of household insecurity. Develop and evaluate alternative methods of providing life skills to resource stressed households. Examine the processes employed by resource stressed families to establish family food patterns.

**APPROACH:** Food system communication forums, community food coalitions, and formal and non-formal youth education will be used to increase awareness of household food insecurity. Informal discussions and situation assessment will be used to develop pilot programs that will undergo formative and summative evaluation. A pilot study will establish the interview process to be used in a longitudinal study of young, childless couples.

**Listing of other Penn State Projects with primary activity within Goal 3:** *For further information on any of the following projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

- 3417 EFFECTS OF DIET ON LIPOPROTEINS AND HEMOSTASIS
- 3442 BRAIN CATECHOLAMINE METABOLISM IN IRON DEFICIENCY
- 3447 ASSESSMENT OF NUTRITIONAL RISK IN THE ELDERLY
- 3610 IDENTIFYING STRATEGIES FOR INCREASING CONFIDENCE IN THE U.S. FOOD SYSTEM
- 3658 EXAMINING FOOD ISSUES IN RESOURCE STRESSED FAMILIES, HOUSEHOLDS, AND COMMUNITIES

## **Goal 4: An agricultural system which protects natural resources and the environment.**

### **Issue(s):**

In a time of farm consolidations, vertical integration, mining, clear-cut logging, etc. the complex relationships between soil, water, air, and biotic resources need to be better understood to assure that our agricultural, forest, and aquatic environments are sustained for future generations. Management options that preserve our environment must be developed in a context of sustained family incomes and sustainable communities. All of the identified issues contain short-, intermediate-, and long-term components. The stakeholder process detailed on page [26](#) in the "Stakeholder Input" section was utilized for the identification of these issues.

### **Performance Goal(s):**

Develop new technologies that reduce negative impact on the environment while sustaining agricultural communities and reducing problems at the urban/rural interface

### **Output Indicators:**

1. Methods for production and harvest of agricultural and forest products that minimize environmental impact while preserving or enhancing diversity
2. Techniques and strategies for managing and utilizing waste while reducing odors and pollution
3. Impacting the world by exporting new environmentally friendly agricultural and forestry technologies

### **Outcome Indicators:**

1. Improved water quality in rivers and streams in the state of Pennsylvania
2. New fertilizer formulations and delivery systems that minimize runoff and subsurface water contamination
3. Adoption of agricultural practices that preserve soil quality and minimize erosion
4. Waste management techniques reducing local and long distance impact
5. Adoption of crop production and forest management practices that enhance biodiversity while assuring productivity and economic viability

### **Key Program Component(s):**

Research projects will focus on:

1. Reducing water pollution attributable to farm animals, fertilizer application and forestry practices;
2. Developing agricultural and forestry practices that conserve our soils and their productivity; and
3. Developing pest control practices that reduce nontarget exposure while treating with environmentally safe products.

**Internal and External Linkages:**

Penn State will continue linkages with extension, other educational institutions, state and federal agencies, industries, foundations, and international centers and/or universities (see Appendix B). We will continue to work with the Penn State Intellectual Property Office to identify emerging technologies for licensing and/or patent development. As emerging relationships develop with other universities and federal partners and as they progress to formal linkages, they will be reported in the annual reporting process.

**Target Audiences:**

Environmental problems identified by stakeholder listening sessions conducted throughout the Commonwealth will identify priorities and target audiences. Benefits should accrue to all citizens of the state of Pennsylvania, and should contribute to local, regional, and national needs.

**Program Duration:**

This program of approximately 45 projects will continue for five years.

**Allocated Resources from ALL appropriated sources directed to Goal 4 (\$ in thousands):<sup>1</sup>**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
\$4,001	\$4,081	\$4,163	\$4,246	\$4,331	\$4,418

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition to the appropriations indicated in the table above, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations.

**Allocated SYs to Goal 4 (in units):**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
26.54	26.54	26.54	26.54	26.54	26.54

**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.** It is intended that we would report not only scholarly output, but also linkages into the programmatic area; partnering across the college, region, and beyond; leveraging of additional resources; and impact on stakeholders.

~~**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.**~~

**3415- EVALUATING FIELD, FARM, AND REGIONAL NUTRIENT BALANCE**

**OBJECTIVES:** Develop material movement and nutrient balance models of dairy and intensive livestock farms. Conduct field measurements of material movement and nutrient balance on farm. Develop a nutrient budget for a regional Pennsylvania watershed.

**APPROACH:** Microcomputer-based models will be developed to track farm material movement using commercially available software or adapting generic software. Time and space dynamics and component balances will be evaluated. An optimization model with field, storage, animal and management input/output activities for dairy, non-ruminant (i.e. poultry and swine) or mixed (ruminant and non-ruminant) livestock farms will be adapted from the mainframe computer to a microcomputer. Actual material movement and management operations will be monitored on typical Pennsylvania crop and livestock farms. A regional nutrient budget will be developed based on farm and business analysis.

### **3601 - ASSESSMENT AND MANAGEMENT OF SOIL AND LAND RESOURCES USING GEOGRAPHIC INFORMATION SYSTEM TECHNOLOGY**

**OBJECTIVES:** Conduct field research to improve soil database quality. Develop improved spatial GIS databases, analytical methods, and delivery systems. Develop spatial Decision Support Systems (DSS) for resource management applications. Evaluate GIS and remote sensing for use in precision farming.

**APPROACH:** Field studies will address soil spatial variability and quantify soil processes important for land use. Soil hydrology and precision farming data needs will be emphasized. New analytical information extraction methods will be developed to improve the quality of soils and other natural resource GIS databases. Improved methods to disseminate spatial resource databases will be implemented and/or developed. Decision support systems (DSS) will be developed for resource assessment and management applications by combining GIS databases, numerical models, and graphical-user interfaces. GIS, remote sensing, global positioning, and related technologies will be applied to precision farming.

### **3629 - NUTRIENT MANAGEMENT IN CROP-LIVESTOCK SYSTEMS**

**OBJECTIVES:** Evaluate techniques to estimate residual nutrient effects in soils. Evaluate the potential environmental impact of residual N and P in crop-livestock systems. Develop decision support systems for managing residual nutrients.

**APPROACH:** Nutrient availability of nutrients from animal wastes will be evaluated. Field studies will be conducted to determine the fate of the nutrients in these materials. The potential environmental impact of residual nutrients will be evaluated through a review of the literature on phosphorus behavior in agricultural systems. Also, field studies looking at the fate of both N and P from agricultural waste management systems will be conducted. Management systems will be proposed. Decision support systems to assist farmers with making agronomically, economically, and environmentally sound nutrient management decisions will be developed.

**Listing of other Penn State Projects with primary activity within Goal 4:** *For further information on any of the following projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

3394 EFFECTS OF FOREST FRAGMENTATION BY AGRICULTURE AND SUBURBAN DEVELOPMENT ON FOREST BIRDS

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- 3405 GENDER, AGRICULTURE, AND THE ENVIRONMENT IN RURAL AREAS & ENVIRONMENTAL CONDITIONS
- 3415 EVALUATING FIELD, FARM, AND REGIONAL NUTRIENT BALANCE
- 3426 EXPERIMENTAL MANAGEMENT OF FISH POPULATIONS AND THEIR HABITATS IN PENNSYLVANIA WATERS
- 3432 INDIVIDUAL CONTRACTS AS A MARKET-BASED APPROACH TO PUBLIC MANAGEMENT OF AGRICULTURAL PERFORMANCE
- 3444 ECOLOGY AND SYSTEMATICS OF FRESHWATER FISHES
- 3455 AIR POLLUTION EFFECTS TO FOREST TREES AND ECOSYSTEMS
- 3461 EROSION AND SEDIMENTATION CONTROL PROCESSES
- 3464 WILDLIFE BIODIVERSITY ASSOCIATED WITH MANAGED FOREST STANDS IN PENNSYLVANIA
- 3475 LONG-TERM EFFECTS OF VARIATIONS IN SOIL AND CROP MANAGEMENT SYSTEMS
- 3479 GREENHOUSE WATER AND WASTE WATER MANAGEMENT
- 3481 APPLICATION MODE AND FORMULATION EFFECTS ON HERBICIDE LEACHING AND RUNOFF
- 3485 SPATIAL SYNTHESIS FOR IDENTIFICATION OF LANDSCAPE ISSUES IN FOREST RESOURCE MANAGEMENT
- 3487 GENETIC CHARACTERIZATION OF COLD AND SALT STRESS TOLERANCE AND GERMPLASM IMPROVEMENT IN TOMATO
- 3491 EFFECTS OF MINERAL-ORGANIC INTERACTIONS ON CHEMICAL PROCESSES IN SOILS
- 3498 BEST MANAGEMENT PRACTICES TO IMPACT WATER AND SOLUTE TRANSPORT FROM AGRICULTURAL LANDS
- 3515 CHARACTERIZATION AND MECHANISMS OF PLANT RESPONSES TO OZONE IN THE NORTHEASTERN U.S.
- 3526 ECOLOGICAL INDICATORS & RESTORATION STRATEGIES FOR WETLAND/RIPARIAN/STREAM COMPONENTS OF LANDSCAPES
- 3542 IMPLEMENTATION OF NE REGIONAL PESTICIDE IMPACT ASSESSMENT PROGRAM
- 3544 AGRICULTURE, ECONOMIC DEVELOPMENT, AND THE ENVIRONMENT
- 3552 REGULATION OF THE AH RECEPTOR SIGNAL TRANSDUCTION PATHWAY
- 3554 ECOLOGY, POPULATION DYNAMICS, AND MANAGEMENT OF FISHERY RESOURCES IN PA & THE GREAT LAKES
- 3570 MOLECULAR TAGGING OF GENES CONTROLLING SALT TOLERANCE IN TOMATOES
- 3571 WASTEWATER IRRIGATED FORESTS FOR TIMBER AND WILDLIFE IN PENNSYLVANIA
- 3577 THE INFLUENCE OF HABITAT QUALITY ON THE STRUCTURE AND FUNCTION OF AQUATIC COMMUNITIES
- 3581 NAPIAP IN PENNSYLVANIA FY 1997
- 3582 IMPLEMENTATION OF NE REGIONAL PESTICIDE IMPACT ASSESSMENT PROGRAM
- 3584 DEVELOPMENT OF INDICATORS OF SOIL HEALTH IN AGRICULTURAL SYSTEMS
- 3590 ASSESSING THE IMPACT OF THE CLEAN AIR ACT OF 1990 ON STREAM CHEMISTRY
- 3595 CHARACTERIZATION AND GENESIS OF PENNSYLVANIA SOILS

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- 3601 ASSESSMENT AND MANAGEMENT OF SOIL AND LAND RESOURCES USING GEOGRAPHIC INFORMATION SYSTEM TECHNOLOGY
- 3608 EVOLUTION OF VARIABLE-CHARGE SOIL PROPERTIES ALONG A CHRONOSEQUENCE IN HAWAII
- 3618 THE NATIONAL ATMOSPHERIC DEPOSITION PROGRAM (NADP)
- 3621 ECONOMIC EVALUATION OF WATER RESOURCE IMPACTS FROM PROJECTED CLIMATE CHANGE
- 3622 ALTERNATIVE PEST MANAGEMENT PRACTICES FOR MINOR TREE FRUIT CROPS IN PENNSYLVANIA
- 3629 NUTRIENT MANAGEMENT IN CROP-LIVESTOCK SYSTEMS
- 3635 LAND-BASED SOLUTION FOR MUNICIPAL/AGRICULTURAL/INDUSTRIAL WASTE DISPOSAL
- 3639 REGULATION OF GENE EXPRESSION BY PEROXISOME PROLIFERATORS
- 3641 ECONOMIC AND ENVIRONMENTAL BENEFITS OF WATERSHED RESTORATION FOR RURAL COMMUNITIES
- 3647 BENEFITS AND COSTS OF RESOURCE POLICIES AFFECTING PUBLIC AND PRIVATE LAND
- 3651 ANIONIC CLAYS: POTENTIAL ION-EXCHANGE FERTILIZERS
- 3654 ECONOMIC ASSESSMENT OF COOPERATIVES AS A MARKETING STRATEGY FOR TOURISM
- 3656 A GENETIC ANALYSIS OF AGE-RELATED CHANGES IN T-CELL ACTIVATION RESPONSES IN MICE
- 3666 LINKING BIOTIC AND ABIOTIC N-IMMOBILIZATION IN FOREST SOILS
- 3668 NEW PRODUCTION SYSTEMS FOR SPECIALTY AND FRESH MARKET POTATOES

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

### **Issue(s):**

Rural communities are facing many challenges as a result of structural changes in Pennsylvania's agricultural industry and its economy as a whole. Youth in both urban and rural environments are at risk due to social and economic pressures. At the urban rural interface, conflicts are emerging between rural and urban expectations. All of the identified issues contain short-, intermediate-, and long-term components. The stakeholder process detailed on page [##-26](#) in the "Stakeholder Input" section was utilized for the identification of these issues.

### **Performance Goal(s):**

Improve the quality of life for families and sustainable development of rural communities by enhancing economic and social opportunities

### **Output Indicators:**

1. Development of techniques for use by communities in identifying opportunities for expanding the income base of families
2. Greater understanding of fiscal policy and economic development policy, including workforce needs and limitations in the provision of community services
3. Improved awareness of the factors that result in poor or destructive decisions by family members

### **Outcome Indicators:**

1. Improved income, employment opportunities, and community policy-making
2. Quality of life improvements for families in communities
3. Reduced number of youths-at-risk

### **Key Program Component(s):**

Research projects will focus on:

1. Developing strategies for increasing and stabilizing family income through community development;
2. Developing lifelong education strategies to maintain and enhance employability;
3. Developing tools for assessing impacts of social, environmental, and technological change; and
4. Utilizing retirement, tourism, and alternative enterprises (particularly those based on emerging technologies) to stabilize communities.

### **Internal and External Linkages:**

Penn State will continue linkages with extension, other educational institutions, state and federal agencies, industries, foundations, and international centers and/or universities (see Appendix B). We will continue to work with the Penn State Intellectual Property Office to identify emerging technologies for licensing and/or patent development. As emerging relationships develop with other universities and federal partners and as they progress to formal linkages, they will be reported in the annual reporting process.

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**Target Audiences:**

We will focus on major community groups and local government and community decision makers and pay particular attention to disadvantaged and underserved citizens.

**Program Duration:**

This program of approximately 33 projects will continue for five years.

**Allocated Resources from ALL appropriated sources directed to Goal 5 (\$ in thousands):<sup>1</sup>**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
\$2,934	\$2,993	\$3,053	\$3,114	\$3,176	\$3,240

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition to the appropriations indicated in the table above, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations.

**Allocated SYs to Goal 5 (in units):**

Current	FFY 2000	FFY 2001	FFY 2002	FFY 2003	FFY 2004
19.46	19.46	19.46	19.46	19.46	19.46

**Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.** It is intended that we would report not only scholarly output, but also linkages into the programmatic area; partnering across the college, region, and beyond; leveraging of additional resources; and impact on stakeholders.

**~~Selected Projects, intended to be representative for reporting purposes of Penn State's activities within this goal.~~**

**3517 - PREVENTING ALCOHOL, TOBACCO, AND OTHER DRUG USE AMONG HIGH- RISK YOUTHS**

**OBJECTIVES:** To develop, implement, and evaluate primary prevention programs to help high-risk children and adolescents avoid alcohol, tobacco, and other drug use, and to reduce risk factors and increase protective factors related to future substance use.

**APPROACH:** A family involvement component will be developed at four Boys and Girls Clubs that also will implement a 3-year youth prevention program. Two other groups of Clubs will implement variations of the same intervention, and one group of Clubs will serve as a control group. A pre-test/post-test nonequivalent groups design, with multiple post-tests will be employed to determine program effects. Three Boys and Girls Clubs will implement a youth, parent, and school program for elementary school Club members that includes a drug prevention program and after-school academic assistance. Parents will participate in a parent program. A randomized experiment with multiple post-tests for children and parents will be used to determine program effects.



**3589 - IMPACTS OF POPULATION AND LAND USE CHANGE ON LOCAL GOVERNMENT FINANCE IN PENNSYLVANIA COMMUNITIES**

**OBJECTIVES:** Develop a county-level Fiscal Impact Model of Pennsylvania. Conduct a longitudinal case study of two rural counties to determine the influence growth management techniques has on the fiscal impacts of change. Examine a variety of local tax issues in Pennsylvania.

**APPROACH:** Use Implan as the basis for the fiscal impact model. Model additional public finance relationships and combine with Implan. Hold intensive interviews annually with local government officials, other local leaders, business people, and citizens in two central PA counties soon to be affected by highway expansion. Supplement with secondary data. A database of local tax data will be compiled from existing secondary data series. Basic tax relationships will be analyzed using this database. In addition, a typology of "typical" taxpayers will be used to estimate the impacts of various tax reform proposals.

**Listing of other Penn State Projects with primary activity within Goal 5:** *For further information on any of the following projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

- 3374 FAMILY BUSINESS: INTERACTION IN WORK AND FAMILY SPHERES
- 3376 THE ECONOMICS OF AGRICULTURAL PRODUCT MARKETS
- 3398 RURAL COOPERATIVES AND THEIR LINKAGE TO THE LOCAL ECONOMY
- 3406 HOUSEHOLD DEMOGRAPHIC BEHAVIOR UNDER DIFFERENT SOCIAL, ECONOMIC, & ENVIRONMENTAL CONDITIONS
- 3410 NORTHEAST REGIONAL CENTER FOR RURAL DEVELOPMENT
- 3427 HISTORICAL ANALYSIS OF AGRICULTURAL ADJUSTMENTS OF PUBLIC SUPPORT FOR AG IN THE US SINCE 1800
- 3470 INDIVIDUALS' JUDGMENTS ABOUT ENVIRONMENTAL RISKS
- 3471 RURAL HEALTH POLICY RESEARCH AND EVALUATION
- 3501 RURAL POVERTY AND ECONOMIC MOBILITY
- 3517 PREVENTING ALCOHOL, TOBACCO, AND OTHER DRUG USE AMONG HIGH-RISK YOUTHS
- 3527 CONSUMER & YOUTH IPM/PESTICIDE ATTITUDE SURVEY & DEV. OF IPM & PEST. EDUC. CURRICULUM MATERIALS
- 3529 FACTORS RELATED TO AFRICAN AMERICAN PARTICIPATION IN AGRICULTURAL EDUCATION
- 3530 NORTHEAST REGIONAL CENTER FOR RURAL DEVELOPMENT
- 3543 EVALUATION OF ALTERNATIVE RESEARCH & EXTENSION EDUCATION INFO & ACCOUNTABILITY DATA SYSTEMS
- 3545 IMPROVING PENNSYLVANIA DAIRY FARM PROFITABILITY (FY 1996)
- 3548 COMMUNITY CHANGE AND RURAL WELL-BEING
- 3549 CONSUMER COMPLAINTS AS PRECIPITANTS OF ORGANIZATIONAL AND POLICY CHANGE

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- 3551 CHANGING SOCIAL INVOLVEMENTS, ATTITUDES, AND WELL-BEING IN AN AGING POPULATION
- 3557 DEVELOPING IMPROVED LANDSCAPE AND CHRISTMAS TREES
- 3572 IMPACTS OF STRUCTURAL CHANGE IN THE DAIRY INDUSTRY
- 3573 IMPROVEMENT OF RURAL AND AGRICULTURAL SAMPLE SURVEY METHODS
- 3586 DEV. AND ANALYSIS OF AN ELECTRONIC DATABASE PROG. MANAGEMENT SYSTEM TO SERVE EXT AGENTS' INFO NEEDS
- 3587 EVALUATION OF PA'S DIVERSE CLIENTELE INVOLVED IN FORMAL AND INFORMAL PROGRAMS IN AG SCIENCES
- 3588 THE DEVELOPMENT OF A CURRICULUM FRAMEWORK FOR AGRICULTURAL EDUCATION IN PENNSYLVANIA
- 3589 IMPACTS OF POPULATION AND LAND USE CHANGE ON LOCAL GOVERNMENT FINANCE IN PENNSYLVANIA COMMUNITIES
- 3603 COMMODITIES, CONSUMERS, AND COMMUNITIES: LOCAL FOOD SYSTEMS IN A GLOBALIZING ENVIRONMENT
- 3611 POLICIES AND STRATEGIES TO ADDRESS RURAL RESOURCE CONFLICTS IN PENNSYLVANIA
- 3623 RURAL ECONOMIC DEVELOPMENT: ALTERNATIVES IN THE NEW COMPETITIVE ENVIRONMENT
- 3630 STUDYING PUBLIC PERCEPTIONS OF SOCIAL ISSUES
- 3631 SEEKING COMMON GROUND: DELIBERATIVE DEMOCRACY AND SUSTAINABLE COMMUNITIES
- 3636 SUSTAINING COMPETITIVE ADVANTAGE THROUGH TECHNOLOGY INNOVATION IN THE US WOOD PRODUCTS INDUSTRY
- 3644 INDUSTRIAL RESTRUCTURING AND INDIVIDUAL COMMUNITY WELL-BEING
- 3659 FIRM LEVEL DECISION-MAKING IN THE MARKET PLACE



**Stakeholder Input:**

The core of our stakeholder input is received through the Cooperative Extension Partnership. Details of the statewide needs assessment process and county, regional, and statewide meetings is detailed in the Penn State Cooperative Extension Plan of Work.

In addition, we participate in the following meetings with stakeholders in which we receive information on their needs and aspirations as well as communications on the quality and value of our present programs and where emphasis should be made or changed. These~~All stakeholder meetings will provide feedback on research programming for Hatch, McIntire-Stennis and Animal Health research programming. We will continue to meet with groups such as:~~funds.

American Cocoa Research Institute Advisory Committee

Animal Diagnostic Laboratory

Broiler Advisory Committee

Broiler Research Check-Off Meeting

Center for Watershed Stewardship Advisory and Executive Boards

Christmas Tree Advisory Task Force

Dairy Stakeholders

Egg Advisory Committee

Egg Research Check-Off Meeting

Goddard Chair Advisory Board

Government/Industry Day

Horticulture Council

Industrial and Professional Advisory Council (IPAC)

Industry and Advisory Committee on Food and Agricultural Systems

Landscape Contracting Assessment

Liaison Council

Municipal Tree Restoration Project Executive Board

Penn Ag and Meat/Egg Council Meeting

Penn State Agricultural Council

PennAg Industries Association

Pennsylvania Association for Sustainable Agriculture

Pennsylvania Christmas Tree Growers Task Force

Pennsylvania Farm Bureau Leadership

Pennsylvania Game Bird Conference and Planning Meeting

Pennsylvania State Council of Farm Organizations

Pennsylvania Tree Improvement Program Board of Directors

Potato Task Force

Poultry Health Meeting with the Pennsylvania Department of Agriculture

Poultry Science Industry Advisory ~~Committee~~Committee

School of Forest ~~Resources~~Resources Advisory Board

State Horticulture Association of Pennsylvania Extension Advisory Committee

Tree Fruit Grower Field Day

**Merit and Peer Review:**

Review Process for NON-Multi-State Research Projects: A one-page summary of proposed research is created and includes the title, personnel involved, planned objectives and approach, suggested duration, and names of advisory committee members. The prospectus is then submitted to the unit leader who will identify two or three people to review the proposed research. A review form (Appendix C) that indicates nine criteria must be completed by each reviewer. This form must be signed by the reviewer and the unit leader and then forwarded to the Director of the Agricultural Experiment Station. The Director then reviews the prospectus for clarity of the objectives and approach, potentially identifies or discusses other relevant research and scientist(s) for the project, and explores funding sources for the project. Once the Director completes the review, he signs the review form and returns it to the investigator. A project outline is then created, taking into consideration any comments made by the reviewers, unit leader, and/or Director. This outline includes a brief, clear, and specific title; a statement of justification; an explanation of the previous work and present outlook; a concise, logically arranged, and numbered series of objectives; a numbered list of procedure statements to correspond with each numbered objective; a list of literature cited; a proposed duration period; an estimate of financial support; a list of personnel involved; names of the advisory committee (optional); a list of institutional units involved; and any other cooperation. Once the outline is completed, it is returned to the unit leader who will forward it to the same reviewers used for the prospectus for their critique and recommendation. After the outline has been approved it is forwarded (with other required forms) to the Director for final review and submission to the CRIS office at USDA.

Review Process for Multi-State Research Projects: As required by USDA, every multi-state hatch project must have project proposals peer reviewed by qualified and knowledgeable scientists. The reviewers' critique and comments provide the Northeast Regional Research Committee with a mechanism for enrichment and improving the research proposals. Similar processes are followed by the Southern, North Central and Western regions.

**Multi-Institutional and Multi-State:**

Penn State University presently participates in 34 formal regional projects that are listed below. These projects are largely responsible for our multi-institutional and multi-state effort. In addition, we have 5 additional projects that are managed through memoranda of agreement (both signed or in development) that coordinate and/or fund multi-state research.

*For further information on any of the following regional projects, please refer to the CRIS website at <http://ctr.uvm.edu/cris>.*

## Penn State's Research Plan of Work

### GOAL 1

- S 233 3395 GENETIC RELATIONSHIPS OF GROWTH AND REPRODUCTION IN DIVERSE POULTRY POPULATIONS
- NE171 3443 BIOLOGICAL AND CULTURAL MANAGEMENT OF PLANT-PARASITIC NEMATODES
- NE127 3445 BIOPHYSICAL MODELS FOR POULTRY PRODUCTION SYSTEMS
- NE132 3446 ENVIRONMENTAL AND ECONOMIC IMPACTS OF NUTRIENT FLOWS IN DAIRY FORAGE SYSTEMS
- NE124 3448 GENETIC MANIPULATION OF SWEET CORN QUALITY AND STRESS RESISTANCE
- NE 92 3449 INTEGRATING COVER CROPS, CULTIVATION AND HERBICIDES TO OPTIMIZE WEED CONTROL
- NE183 3450 MULTIDISCIPLINARY EVALUATION OF NEW APPLE CULTIVARS
- NC136 3506 IMPROVEMENT OF THERMAL PROCESSES FOR FOODS
- NC205 3513 ECOLOGY AND MANAGEMENT OF EUROPEAN CORN BORER AND OTHER STALK-BORING LEPIDOPTERA
- NE148 3516 REGULATION OF NUTRIENT USE IN FOOD-PRODUCING ANIMALS
- NE161 3566 ASSOCIATION OF FERTILITY WITH TEMPORAL CHANGES IN OVARIAN FUNCTION OF DOMESTIC RUMINANTS
- NE184 3575 DEVELOPMENT OF NEW POTATO CLONES FOR ENVIRONMENTAL & ECONOMICAL S-USTAINABILITY IN THE NORTHEAST
- S 274 3585 INTEGRATED MANAGEMENT OF ARTHROPOD PESTS OF LIVESTOCK AND POULTRY
- NE179 3617 TECHNOLOGY AND PRINCIPLES FOR ASSESSING AND RETAINING POSTHARVEST QUALITY OF FRUITS AND VEGETABLES
- NC185 3620 METABOLIC RELATIONSHIPS IN SUPPLY OF NUTRIENTS FOR LACTATING COWS
- NE112 3624 MASTITIS RESISTANCE TO ENHANCE DAIRY FOOD SAFETY
- NC119 3625 ~~MANAGEMENT~~ MANAGEMENT SYSTEMS FOR IMPROVED DECISION MAKING AND PROFITABILITY OF DAIRY HERDS
- NC140 3626 ROOTSTOCK AND INTERSTEM EFFECTS ON POME- AND STONE-FRUIT TREES
- NC142 3627 REGULATION OF PHOTOSYNTHETIC PROCESSES
- NC 62 3628 ENTERIC DISEASES OF SWINE AND CATTLE: PREVENTION, CONTROL, AND FOOD SAFETY
- S 284 3645 GENETIC ENHANCEMENT OF HEALTH AND SURVIVAL FOR DAIRY CATTLE
- NE 60 3667 GENETIC BASES FOR RESISTANCE AND IMMUNITY TO AVIAN DISEASES
- NE164 3672 DECISION SUPPORT FOR DESIGN AND CONTROL OF PLANT GROWTH SYSTEMS

## Penn State's Research Plan of Work

### GOAL 2

- NC129 3514 FUSARIUM MYCOTOXINS IN CEREAL GRAINS
- NE103 3664 POSTHARVEST PHYSIOLOGY OF FRUITS

### GOAL 3

- NE172 3447 ASSESSMENT OF NUTRITIONAL RISK IN THE ELDERLY

### GOAL 4

- NE176 3515 CHARACTERIZATION AND MECHANISMS OF PLANT RESPONSES TO OZONE IN THE NORTHEASTERN U.S.
- NRSP3 3618 THE NATIONAL ATMOSPHERIC DEPOSITION PROGRAM (NADP)
- W 133 3647 BENEFITS AND COSTS OF RESOURCE POLICIES AFFECTING PUBLIC AND PRIVATE LAND

### GOAL 5

- NE167 3374 FAMILY BUSINESS: INTERACTION IN WORK AND FAMILY SPHERES
- NE177 3572 IMPACTS OF STRUCTURAL CHANGE IN THE DAIRY INDUSTRY
- W 183 3573 IMPROVEMENT OF RURAL AND AGRICULTURAL SAMPLE SURVEY METHODS
- NE185 3603 COMMODITIES, CONSUMERS, AND COMMUNITIES: LOCAL FOOD SYSTEMS IN A GLOBALIZING ENVIRONMENT
- NE162 3623 RURAL ECONOMIC DEVELOPMENT: ALTERNATIVES IN THE NEW COMPETITIVE ENVIRONMENT

### Projected Hatch and Multi-State Hatch Funds (\$ in thousands): <sup>1</sup>

Goal	Hatch	Multi-State Hatch
<b>1</b>	\$2,966	\$803
<b>2</b>	\$146	\$39
<b>3</b>	\$91	\$25
<b>4</b>	\$819	\$222
<b>5</b>	\$600	\$163
<b>Total</b>	<b>\$4,621</b>	<b>\$1,252</b>

#### Multi-Disciplinary:

The Pennsylvania Agricultural Experiment Station currently has approximately 254 projects; 74 projects (approximately 29 percent) involve multiple departments. Penn State has exceeded the 25% multi-disciplinary ~~requirement~~requirement in the past and plans to continue to do so for the duration of this plan of work.

#### Integrated Activities:

Penn State University, under President Graham Spanier, has set a goal of becoming "the premier university in the nation in the integration of high-quality teaching, research, and service." The University's strategic plan, *Academic Excellence*:

## Penn State's Research Plan of Work

*Planning for the Twenty-First Century* states, "We seek a University that is passionately committed to excellence and academic achievement, embraces diversity and rejects intolerance, encourages discovery and the creation of new knowledge, serves the Commonwealth, and leads the nation in the integration of high-quality teaching, research, and service."

Penn State's College of Agricultural Sciences, Penn State Cooperative Extension, and Penn State's Experiment Station have a long-standing commitment to integrating research and extension activities at Penn State. The College of Agricultural Sciences Strategic Plan Update for July 1, 1997 - June 30, 2002 states:

Research programs contribute to the education and outreach missions of the College by covering a broad range of scientific issues, from questions of fundamental science to the mission-oriented research dedicated to helping people, communities, and industries solve problems. Close integration with the College's cooperative extension program creates a research program that is both relevant and responsive to the needs of society. . . . These ongoing research efforts and related education programs are vital to assuring profitability of American food and fiber systems through internationally competitive agricultural production, a safe and secure food and fiber system, harmony between agriculture and the environment, quality of life of citizens, and well-prepared graduates.

At the Dean's level, each associate dean has responsibility for cross-functional initiatives and activities. Each of the twelve academic department heads has an appointment split evenly between extension, research, and resident education. The Dean, associate deans, academic department heads, and the Directors and Associate Director meet together regularly to discuss current and future issues in integrated research and extension programming.

The vast majority of faculty with research responsibilities in Penn State's College of Agricultural Sciences also have appointments in either extension or teaching. These faculty members conduct basic and applied research, along with their colleagues, which inform and shape extension programs.

Of 500 faculty and staff at University Park who are supported with research funds, 216 have split research and extension appointments. Funds supporting the research portion of these positions easily account for 25% of research hatch and multi-hatch funds. In addition to the integration of research and extension activities in the appointments of faculty and staff, the College also integrates research with resident education, with 341 research faculty and staff at University Park having appointments that includes a resident education component.



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**Projected Resources:**

**Projected Total Resources from ALL appropriated sources (\$ in thousands): <sup>1</sup>**

Goal	Current	FFY 00	FFY 01	FFY 02	FFY 03	FFY 04	Total
1	\$14,494	\$14,784	\$15,080	\$15,381	\$15,689	\$16,003	<b>\$91,431</b>
2	\$711	\$726	\$740	\$755	\$770	\$785	<b>\$4,487</b>
3	\$445	\$453	\$463	\$472	\$481	\$491	<b>\$2,805</b>
4	\$4,001	\$4,081	\$4,163	\$4,246	\$4,331	\$4,418	<b>\$25,240</b>
5	\$2,934	\$2,993	\$3,053	\$3,114	\$3,176	\$3,240	<b>\$18,510</b>
<b>Total</b>	<b>\$22,585</b>	<b>\$23,037</b>	<b>\$23,499</b>	<b>\$23,968</b>	<b>\$24,447</b>	<b>\$24,937</b>	<b>\$142,473</b>

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health) and state appropriated funds (General).

In addition, funds are received from competitive sources (both state and federal) as well as foundations, trusts, and industry. These funds contribute materially to the conduct and impact of our research programs under this goal and are the result of leveraging our base appropriations. The effect of leveraging federal appropriated dollars can be determined by examining the diversity of sponsors and quantity of dollars generated from non-appropriated sources (Appendix **DB**). These leveraged dollars almost triple our base appropriation.

**Projected Federal Outlays (\$ in thousands): <sup>1</sup>**

Goal	Current	FFY 00	FFY 01	FFY 02	FFY 03	FFY 04	Total
1	\$4,134	\$4,217	\$4,301	\$4,387	\$4,475	\$4,564	<b>\$26,078</b>
2	\$203	\$207	\$211	\$215	\$220	\$224	<b>\$1,280</b>
3	\$127	\$129	\$132	\$135	\$137	\$140	<b>\$800</b>
4	\$1,141	\$1,164	\$1,187	\$1,211	\$1,235	\$1,260	<b>\$7,198</b>
5	\$837	\$854	\$871	\$888	\$906	\$924	<b>\$5,280</b>
<b>Total</b>	<b>\$6,442</b>	<b>\$6,571</b>	<b>\$6,702</b>	<b>\$6,836</b>	<b>\$6,973</b>	<b>\$7,113</b>	<b>\$40,636</b>

The dollars indicated in the above chart include federal appropriated funds (Hatch, Multi-State Hatch, McIntire-Stennis, and Animal Health).

**Projected SYs (in units):**

Goal	Current	FFY 00	FFY 01	FFY 02	FFY 03	FFY 04	Total
1	96.12	96.12	96.12	96.12	96.12	96.12	576.72
2	4.72	4.72	4.72	4.72	4.72	4.72	28.32
3	2.95	2.95	2.95	2.95	2.95	2.95	17.70
4	26.54	26.54	26.54	26.54	26.54	26.54	159.24
5	19.46	19.46	19.46	19.46	19.46	19.46	116.76
<b>Total</b>	<b>149.79</b>	<b>149.79</b>	<b>149.79</b>	<b>149.79</b>	<b>149.79</b>	<b>149.79</b>	<b>898.74</b>

Penn State's Research Plan of Work

**Certification:**

.....  
Dr. Paul A. Backman  
Director, Pennsylvania Agricultural Experiment Station

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Date

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<sup>1</sup>The resources indicated in this document are based on FY1999 projections and do not include fringe benefits or University overhead.