2002 Annual Report
PLAN OF WORK

State of Delaware

University of Delaware
College of Agriculture and
Natural Resources

Delaware State University
College of Agriculture and
Related Sciences

March 1, 2003

The annual report on the comprehensive
Plan of Work for the
1890 and 1862 Land Grant University
Research and Extension Programs
Serving the Citizens of the State of Delaware

INTRODUCTION

This is the annual report on the Plan of Work for Delaware's research and extension activities, as required by the Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA), and follows the USDA "Guidelines for Land Grant Institution Plan of Work." This report includes the research and extension activities supported by USDA at Delaware State University and the University of Delaware.

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A. PLANNED PROGRAMS

NATIONAL GOAL 1. AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

For Delaware's billion-dollar poultry industry, the economic damage caused by infectious organisms on animal health has devastating potential. Using biotechnology techniques and animal genomics research to unravel the fundamental mechanisms of poultry diseases, UD researchers develop recombinant vaccines that combat current and emerging infectious diseases in poultry, thus preventing catastrophic losses. In addition, the UD Poultry Diagnostic Laboratory annually examines 700 disease cases and tests 20,000 blood samples for antibodies in order to monitor for diseases and to assess the effectiveness of vaccination programs.

The Integrated Pest Management (IPM) team developed a multi-state approach to watermelon IPM, focusing on a total crop management system. Innovations included the development of alternative mite management, which resulted in a savings of $20 per acre in reduced miticide use. Fly management on dairy farms, if not controlled, can contribute to a five to 25 percent loss in milk production. Whole farm surveys to determine possible breeding areas were conducted, resulting in the use of citric acid as an edge treatment and use of alternative beddings, for a reported reduction in insecticide use by as much as 60 percent.

In today's environment, agricultural profitability means livestock producers must improve forage production and extend the grazing season through irrigation, one aspect of an ongoing UD study on Delaware pasture management.

Soybean variety selection has an impact on agricultural profitability so cultivar performance trials are conducted yearly by UD researchers and the results are widely disseminated to growers. These trials are an important factor in estimating the potential impact of choosing a cultivar based on its performance.

The management of mushroom flies in commercial mushroom crops has become increasingly difficult, so researchers at UD are investigating a number of alternatives for use in these crops, including pesticides with novel chemistries and new modes of action: a growth regulator, nematode parasites, a botanical pesticide, and a bacterium producing proteins toxic to fly larvae.

Plant health is critical to soybean growers, and two new potentially yield-reducing plant diseases have been identified in Delaware: sudden death syndrome in soybeans, caused by a soil-borne fungus, and wheat streak mosaic virus. Knowing that these diseases are present allows UD scientists and Extension personnel to mount research and educational efforts to prevent these plant diseases from becoming serious problems for Delaware growers. Also, a major effort was made in lima bean fields to control downy mildew, which caused significant losses in areas where control measures were implemented too late.

Pond research at Delaware State University has been exploiting farm diversification through an array of low-technology aquaculture crops that can provide local farming operations with niche markets. The emphasis of this research has been on alternative aquaculture crops and management techniques that minimize disruption of current farming and maximize available resources. DSU focused on developing management practices for the culture of two species of bait minnows, both of which are native to the region and highly prized as bait in local waters. Preliminary production data demonstrates that these bait minnows are a viable alternative agricultural crop in the mid-Atlantic region.

Culinary herbs and essential oils continue to be one of the premier programs at Delaware State University. The Claude E. Phillips Herbarium and Herb Research Center at DSU analyzes living plants, dried botanicals, and essential oils to help small farmers, manufacturers and distributors of herbs who have no means of certifying their products as safe. A National Collection Scheme of living herbs has been introduced to preserve materials as well as provide correctly labeled herbs to gardeners, farmers, nurseries, and researchers. DSU also is a primary source of information on herbs and their nomenclature for a worldwide audience, including manufacturers of dietary supplements and other foods products.

DSU held an international conference devoted to sedges, an ecologically and economically important plant that supports wildlife in wetland habitats around the world.

Topics discussed included the impact of sedges as weeds, gardening with sedges, the importance of sedges in wetlands restoration, and the systematics of several genera of sedges.

Delaware grows more than 40,000 acres of vegetables for processing. But processors for vegetable crops were leaving the state, creating a loss of millions of dollars in farm income. Working through trade organizations and personal contacts, UD's Extension specialist for vegetable crops proactively sought new processors. In 2002, two new companies began operations in Delaware -- Kenny Produce LLC began a pickling cucumber grading operation that generates $3.5 million in annual cash farm income for 15 producers, and PictSweet Frozen Foods opened, with plans to use 10,000 acres of production in peas, sweet corn, and lima beans.

Current pickling-cucumber harvesting methods fail to remove dirt and cause excessive product damage so an innovative farming technique was needed. UD researchers constructed a pickling-cucumber harvester that reduces dirt on the final product by 8.5 percent. The innovative redesign of the conveyer also decreases product abrasion by 5 percent. With the new harvester, growers are saving $60 per acre on 6,000 acres in Delaware, thus increasing plant production efficiency.

To assist the small farmer, DSU initiated the Small Farmer Technical Assistance and Outreach Program, offering a variety of workshops, seminars, and short courses. Courses have included the basics of operating a farm, innovation, and farm entrepreneurship. Farm management specialists work extensively with farmers on a one-on-one basis to tailor the assistance to their individual needs.

A survey conducted by a DSU Extension poultry specialist to determine consumer attitudes about food irradiation and hormones found that most supermarket shoppers mistakenly believe that hormones are used in the production of broiler chickens. In an effort to educate the public, fact sheets and videos were produced to correct this erroneous assumption.

Many herbaceous perennials native to the temperate United States and garden-worthy are wild-dug due to lack of quick, convenient propagation methods. Because the wild-dug method endangers wild gene pools, UD developed micro-propagation protocols, making quick propagation possible and increasing availability. In vitro-generated "plugs" and/or plants of native varieties are now available for ornamental agriculture growers and for the home gardening market.

Seedless watermelons have become the choice of consumers, making the seedless varieties more commercially profitable for melon growers than the seeded ones. UD studies have demonstrated the advantages of commercial seedless watermelon production, which has grown from zero to 1,300 acres and a $3.2 million-dollar increase in profit for Delaware seedless watermelon growers over the past three years.

In the UD corn breeding project, two inbred maize lines were released as plant germplasm. Developed at UD, these lines promise drought tolerance, European corn borer resistance, and desirable agronomic performance.

For the plant-disease-causing nematodes that each inflict 100 billion in damage to crops worldwide, UD molecular biologists are using biotechnology to explore ways to build in genetic resistance in the plant.

DSU is involved in a long-term program to control the gypsy moth, a devastating pest of northeastern forest and shade trees. DSU is working to adapt virus strains and formulations, with or without enhancing agents, for use by arborists, nurserymen and people living in urban communities. Improving biological control methods for controlling gypsy moth will protect the environment from chemical sprays and introduce long-term biological control into gypsy moth populations.

Dairy-animal nutrition studies at UD have led to proven methods for increasing the quality of silage and improving forage that enhances milk production, lowers feed costs, and reduces environmental waste from spoiled silage. Also, since silage spoils readily when exposed to air, a new product that improves the aerobic stability of silage was developed. The product was based on research conducted at UD on a new silage inoculant containing the bacteria *Lactobacillus buchneri.*

Yield losses from pest infestations can range from 10 to 20 percent because of improper sampling and timing of pesticide applications and improper selection of pest control strategies. To improve agricultural profitability and agricultural competitiveness, dissemination of timely information about pest outbreaks is sent out in a *Weekly Crop Update* newsletter distributed throughout the production season. This commercial management tool enhances agricultural profitability and benefits the environment.

Taking advantage of natural disease resistance in plants has proven to be a promising avenue for plant research at UD. Engineered crop plants that can resist disease will save tens of millions of dollars.

The 2002 Farm Bill's Direct and Counter-Cyclical Program could have a huge impact on the profitability of 6,000 eligible Delaware grain farmers, and decisions they make now will be binding for the next six years. To help farmers understand their options, a UD Extension farm risk specialist created a "Farm Bill Calculator" in an Excel spreadsheet to help farmers nationwide determine their commodities payments based on acreage and yields.

The total expenditures by source of funds and FTE's for goal 1 are:

Hatch Act Funds	$858,534
Smith-Lever Act Funds	$364,537
State Matching Funds	$1,630,016
Full-Time Equivalents	37.7

NATIONAL GOAL 2. SAFE AND SECURE FOOD AND FIBER SYSTEM

UD researchers using high hydrostatic pressure processing for foods are pursuing methods of food processing that offer food borne pathogen protection while preserving food quality. These methods ensure a greater variety of wholesome foods with intact nutrient content, retaining taste and minimizing changes to the product from the raw or fresh state.

UD Extension conducts food safety training of teachers and volunteers who work with youth in 4-H and other youth development groups. The training has significantly increased the youngsters' knowledge of food safety. Since many of the youngsters are responsible for preparing food for themselves and their families, their knowledge of the risks associated with microbial contamination of foods and how to prevent such contamination has resulted in fewer instances of food borne illness.

UD Extension has offered the ServSafe certification course for food service managers throughout Delaware. The risks associated with microbial contamination of foods can be reduced if food handlers use recommended food handling procedures. The ServSafe course gives managers of food service facilities the tools for preventing the wide spread outbreak of food borne illness.

The total expenditures by source of funds and FTE's for goal 2 are:

Hatch Act Funds	$5,163
Smith-Lever Act Funds	$20,576
State Matching Funds	$378,601
Full-Time Equivalents	2.8

NATIONAL GOAL 3. A HEALTHY, WELL-NOURISHED POPULATION

Individuals with limited funds must get the most nutrition for their food dollars. UD Extension's Lifeskills, a new program conducted in cooperation with the Food Bank of Delaware, Inc., and its member agencies, teaches low-income individuals how to plan and prepare nutritious meals on a limited budget.

DSU Extension's Intelligent Eaters Club instructs women between the ages of 17 and 65 who are overweight or obese and interested in improving their health by changing their diets, as well as by engaging in various forms of regular exercise. Another dietary concern -- preventing obesity in children -- was met by DSU Extension programs that train childcare providers on their role in preventing obesity in preschoolers. Creating a positive foodservice atmosphere also was addressed to ensure children develop healthy attitudes towards food.

It is especially important for low-resource families with young children to get the maximum nutrition for their food dollars. The UD EFNEP program instructs low-income

homemakers with children on how to improve their families' diets, encourage good lifelong eating habits, and employ smart shopping and budgeting practices so that monthly food allotments last all month.

"Dining with Diabetes" is a successful three-part educational series on food intake and preparation designed for people with diabetes and their family members or caregivers. It increases participants' knowledge of nutrition and presents healthy versions of familiar foods.

UD Extension also offered classes to childcare providers statewide that focused on the prevention of osteoporosis through nutrition and exercise.

The total expenditures by source of funds and FTE's for goal 3 are:

Hatch Act Funds	---
Smith-Lever Act Funds	$77,007
State Matching Funds	$192,072
Full-Time Equivalents	7.7

NATIONAL GOAL 4. AN AGRICULTURAL SYSTEM WHICH PROTECTS NATURAL RESOURCES AND THE ENVIRONMENT

Soils contaminated by hazardous materials or industrial wastes can result in levels of metals, such as nickel, lead, arsenic, and chromium that could contaminate groundwater. UD researchers have discovered that metals form stable precipitates on the surface of soil minerals, greatly reducing their leachability into groundwater. By understanding how metals interact in soils, models are being developed that will improve scientists' ability to evaluate the potential risk of metal migration. This research is vital for protecting soil and water quality.

Delaware's Nutrient Management Act requires that agricultural waste management practices be developed in poultry-producing areas that are "high" in phosphorus and a potential threat to surface and shallow ground waters. UD researchers have conducted studies that provide scientific justification for these regulations, specifically rapid, accurate soil test methods that can predict when soils are sufficiently saturated with phosphorus to be of environmental concern.

DSU Extension staff assisted with a curbside yard and garden waste-reduction program. DSU staff worked directly with homeowners and gardeners to learn how to best compost yard and vegetable food waste into organic matter for the garden, thus reducing landfill trash and improving the soil.

Nutrient management is an important issue for the sandy soils of the state, especially since the regulation of Total Maximum Daily Load and the realization that many of Delaware's waterways are environmentally degraded. Because poor nitrogen efficiency increases production costs and decreases profitability, farmers are concerned about

nitrogen loss. Based on the acreage involved in the recommendations (about 6,000 acres), farmers estimate that they have reduced nitrogen applications by 18,000 pounds and increased their net income by $45,000.

UD soil scientists are studying the inactivation and transport mechanisms of viruses in porous media under relevant environmental conditions, which provides an important scientific basis for developing regulations to protect water resources from contamination by microbial pollutants.

UD Extension has developed and is carrying out an education/certification program on water quality issues in Delaware so that livestock producers will know how to comply with the new stricter nutrient management regulations. An anticipated long-term impact will be an increase in the knowledge base of affected producers and a corresponding improvement in both the economic efficiency of nutrient management and in water quality conditions in Delaware.

A DSU project in sustainable agriculture was designed to address the needs of farmers and Extension agents interested in two areas: developing an environmentally friendly nutrient use system and growing free-range broilers in a sustainable system. Four formulations of poultry manure, fertilizer and manure/fertilizer blends were imposed on corn, soybeans, and winter wheat in a three-year rotation. The only significant difference was commercial fertilizer, which produces significantly more corn. In two separate broiler growth trials using alfalfa, orchard grass and conventional methods of rearing, no significant differences in growth rate, feed consumed and feed efficiency were found between the broilers grown on forages compared to the conventionally reared birds.

The UD Agroforestry/Tree Planting for Poultry Houses project resulted in a publication and related efforts to establish wind breaks around poultry houses. Landowners who implement such wind breaks can reduce soil erosion by wind, reduce snow velocity, maintain energy efficiency for heating in winter months and cooling in summer months, and improve water and air quality. Forestry resource management is the main concern of a UD educational outreach effort that connects with forest landowners (both rural and urban) to assist them with proper management of forestry crops so they can reap the environmental benefits of proper management.

Wetlands restoration and protection will be enhanced by a current UD project to identify and delineate freshwater wetlands on the Atlantic Coastal Plain even when wetland hydrology is not present because of the season. Three UD research projects on seasonally saturated wetlands will help to identify indicators of historically hydric soils and wildlife species important to determining wetlands. These projects have the potential to improve our ability to identify and delineate seasonally saturated wetlands.

UD programs aimed at ecosystem balance focus on the maintenance of biodiversity in natural ecosystems in ways that are compatible with agriculture and with urban/suburban population growth and development. Program components include

developing and delivering integrated pest management programs -- a systems approach using chemical, cultural, mechanical, and biological control to increase net profits to producers while protecting the environment. The expansion of integrated pest management into processing vegetables, melons, potatoes and ornamentals has led to the refinement of disease and mite management programs in watermelons and other crops.

As Delaware's physical landscape changes from open-space agricultural land and large forest parcels to urban and suburban development, children get less opportunity to explore natural habitats in their neighborhoods or through school classes. Partnering with agencies throughout the state, UD Extension continues to provide environmental outreach education through Delaware ENVIROTHON ™ -- a high school environmental knowledge challenge that covers water quality, wetlands, urban forestry, pests, and tree planting.

Roadside rights-of-way are notorious for allowing the rapid spread of invasive exotic plant species that threaten native vegetation. UD's ongoing collaborative research project with DelDOT and the Delaware Center for Horticulture has planted 34 pilot sites along Delaware roadsides to study methods of establishment, species evaluation, maintenance strategies and economics. The pilot plots have provided information for a design and concept manual to be used by DelDOT that will stipulate roadside vegetation in any new or renovation road project.

The total expenditures by source of funds and FTE's for goal 4 are:

Hatch Act Funds	$374,841
Smith-Lever Act Funds	$101,595
State Matching Funds	$1,113,775
Full-Time Equivalents	16.9

NATIONAL GOAL 5. ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

If children and youth at-risk in limited-resource communities are to grow up to become productive citizens, they need to experience and accumulate more resilience factors than risk factors. UD Extension has been working with community residents in three low-resource communities throughout Delaware to assess needs and strengths, develop resources and implement customized programs to reduce developmental risks and enhance resiliency factors for children and youth.

Primeros Pasos, or First Steps, is a licensed bi-lingual early childcare center that provides safe, affordable and comprehensive childcare to Sussex County's growing Hispanic population. More than just a childcare facility, *Primeros Pasos* is a concerted outreach effort involving UD Extension that engages parents as partners in the education of their children. The targeted families have two working parents and household incomes that fall below the poverty level. Language, cultural, and financial

barriers overwhelm many in this community, making seeking outside help difficult. *Primeros Pasos* also is a vital resource for members of the community with programs that connect Hispanic residents to the social services they may need.

DSU Extension offers a program for low-income, largely minority, at-risk youth who lack the necessary educational skills to pass state mandatory academic testing. Students who do not pass the test cannot go on to the next grade, and often are identified as exhibiting negative social and academic behaviors. The DSU program -- called Ladies and Gentleman's Club -- addresses these issues (with the input of school officials, team leaders, guidance counselors, and concerned adults) and helps youngster learn confidence in and out of the classroom.

High school students who are behind academically need positive experiences in the work world to prepare them to be productive adult citizens. Through the Workforce Preparation Program, overseen by Delaware 4-H, youths are placed in part-time jobs at non-profit organizations during vacation from school. Students also participate in enrichment classes to ensure academic continuity over the summer months. The program provides students with real-work experience on a daily basis, reinforcing the importance of reporting to work as scheduled and the teamwork involved in doing a good job.

Service learning has been shown to have a positive impact on the academic skills of youth who participate as well as instilling a lasting benefit by teaching youth the importance of volunteering. Delaware 4-H engaged at-risk youth in the 4-H Summer of Service Program, the purpose of which was to introduce youth in grades 6 and up to the idea of community service in a concentrated series of volunteer projects. Upon completion of the six-week program, the young people had performed more than 1,100 hours of community service.

Because keeping teens in youth programs can be difficult, UD 4-H has addressed this problem in part with its Counselor-in-Training Program. Teens remain active in the 4-H camping program by serving as camp counselors, thus allowing staff to provide quality programs for this difficult-to-reach audience.

Impressing on youngsters at a teachable age the importance of protecting the environment engenders life-long interest in and commitment to safeguarding our precious resources of soil and water. Basic soil and environmental information is the focus of a three-day summer 4-H camp co-sponsored by Delaware's Institute of Soil and Environmental Quality and Delaware 4-H. Students learn about fertilizers and water contamination, leaching and soil, soil profiles, rainfall, runoff, and ecosystem diversity.

UD Extension workshops in financial management targeting low-resource adults help foster greater financial literacy in topics such as basic money management, debt reduction, educated consuming, and saving for the future.

Teens need opportunities to hone their leadership skills, so Delaware 4-H provides numerous youth development programs in which teens serve as volunteers, including teaching roles at the club and community level, and in county and state programs. Teens also plan and conduct programs and training at all levels. The skills learned in 4-H activities carry over into other parts of their lives. For example, most 4-H teens also serve in leadership roles at church and school, and half the delegates to National 4-H Congress from Delaware were either class president or student government president.

The total expenditures by source of funds and FTE for goal 5 are:

Hatch Act Funds	$3,140
Smith-Lever Act Funds	$ 202,730
State Matching Funds	$ 1,485,512
Full-Time Equivalents	21.0

NATIONAL GOAL 6. SOCIETY READY GRADUATES

With over-development into natural habitats, land use changes, and protection of natural resources reaching a serious stage, there is a need for college graduates with interdisciplinary environmental studies backgrounds to solve current and future environmental problems. Three departments -- entomology and applied ecology, food and resource economics and plant and soil sciences -- joined forces to offer a major in Natural Resources Management (NRM) that focuses on the physical sciences coupled with an understanding of economics, ethics and public policy. This major produces graduates who have the skills to solve “real world” problems; a sound knowledge of the world’s biodiversity; a broad interdisciplinary education in the arts, humanities, and social sciences; and an awareness of the ethical issues in natural resource use and management.

A severe shortage of high school agricultural science teachers is reaching critical levels. Just to meet demand within Delaware, the University of Delaware College of Agriculture and Natural Resources must recruit 20 new students a year for the agricultural education program. Regionally, the demand for agricultural science teachers has risen to 50 to 65 per year, and this at a time when fewer universities offer agricultural education courses. UD’s Agriculture and Technology Education program provides an opportunity for students to get the technical and educational training need to teach agricultural science. The program not only serves traditional undergraduates, but also adults with degrees who are returning to school to complete requirements for certification.

B. STAKEHOLDER INPUT PROCESS

In the State of Delaware, the University of Delaware and Delaware State University used a multi-faceted approach to securing stakeholder input for the original Plan of Work. We believe in direct contact with people and attempt to solicit input from a wide variety of clientele, users, and stakeholders. Opportunities for input include, but are not

limited to, the following: extension overall advisory committees, extension issue-based advisory committees, strengthening families statewide advisory committee, 4-H volunteers, 4-H Foundation, LINKS, agriculture commodity groups, environmental interests, the green industry, agri-businesses, agriculture associations (i.e., Farm Bureau, Grange, Pork Producers Association, Delmarva Poultry Industry, Soybean Board, Sheep Producers Association, etc.), Master Gardeners, Master Food Educators, and Master Financial Planners. We hold a variety of regular meetings across the state, which include a diverse mix of clientele, users, and stakeholders. These meetings include such things as: Delaware Herb Growers Association (DHGA), American Herbal Products Association (AHPA) and American Botanical Council (ABC), Agriculture Visiting Committee, State Chamber of Commerce, Kids County Advisory Council, Delaware Public Policy Institute Task Force, Friends of Agriculture Breakfast series, Council of Farm Organizations, USDA Food and Agricultural Council, State Agriculture Technical Committee, and user groups like 4-H regular and day camp parents. Students enrolled in our colleges, faculty, professionals, and salaried staff, are all encouraged to provide input on program priorities. We have conducted random surveys of users and non-users of the programs and activities on a variety of issues including land use and economic development. Other tools that we use to get input include visioning processes and focus groups.

These efforts have been focused on both building commitment and getting input from stakeholders such as, government agencies, industry partners, and regulatory agencies. Our programs have expanded, and input continues to increase. We are recognized as a source of not only useful but also reliable information. We will continue to seek input in a variety of ways. These methods will change as the issues themselves change.

C. PROGRAM REVIEW PROCESS

Peer Review of Research Programs

We adopt by reference the National Standards for Peer Review.

Merit Review of Extension Programs

Merit review for Delaware Cooperative Extension consists of five levels of peer and stakeholder review. Extension professionals submit county plans that have been reviewed by their peers within the county and by county stakeholder advisory groups. These stakeholder groups provide input on critical needs and issues within their communities, which is used to develop the county plans. After county plans are complete, stakeholders review them for inclusion of the previously identified needs and issues as well as program delivery and evaluation methodologies. Each of these plans includes specific objectives that are examined for relevance, usefulness, and potential impact of the programs. This feedback is used to refine county plans and develop future plans.

The second level of review is by college-wide issue teams that are cross-functional and multi-disciplinary. From this review, county plans are combined into a college-wide five-year plan.

The third level of review is both within and outside the university community. Copies of the plan are submitted to university administrators and related agency personnel who function as both present and future partners. These individuals are invited to comment on the objectives identified, areas of collaboration, and potential impacts. University administrators are also asked to comment on ways in which we might work across colleges and schools to increase our outreach efforts.

A fourth level is with statewide stakeholder groups, including advisory groups, commodity organizations, volunteers, research partners, state and local funders, etc. These groups are asked to provide feedback regarding objectives, potential impacts, and how it meets their specific needs.

The final level is the Northeast Extension directors, who have agreed to share all state plans among each other. This peer review helps the states advise each other on opportunities to strengthen individual state plans and ways that we can collaborate across state lines.

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

Delaware State University and the University of Delaware have participated in numerous programs and projects that are multi-state, multi-institutional, multi-disciplinary, and joint research and extension programs. Sections E, F, and G highlight a few of the successful programs. All twelve program areas in the Delaware Plan of Work involve some multi-state and joint activities.

The planned programs were identified through the stakeholder input process as described in section B. Program evaluations and surveys are being used annually to ensure that the planned programs are still on track and relevant to the needs of the state and region.

Attracting underserved and underrepresented populations is a continuing challenge. During the civil rights audit of the Extension programs in Delaware, several suggestions were made on how to attract more underrepresented groups. The response to the civil rights audit has been submitted to CSREES and the report emphasizes the steps being taken to ensure that we exercise “all reasonable efforts.”

In sections E, F, and G the outcomes and impacts of joint and multi programs are described. These outcomes and impacts are consistent with the description in the Plan of Work.

Delaware State University and the University of Delaware have a tradition of multi-state, multi-institutional, and joint activities. These programs have been effective and efficient

in the past and continue to accomplish their goals. We share faculty with the University of Maryland, combined the dairy herds of Rutgers and Delaware, and participate in region-wide crisis management programs for beekeepers and stone fruit growers.

Further evaluation of planned programs including outcomes and impacts are presented in Sections E, F. and G.

E. INTEGRATED EXTENSION AND RESEARCH

At UD, research and Extension are closely aligned in efforts to provide Delaware producers with information they can put to use. The following examples are highlights of this collaboration, which also can be found in other goal sections of this report.

For Delaware's billion-dollar poultry industry, the economic damage caused by infectious poultry diseases could be devastating. Using biotechnology techniques and animal genomics research to unravel the fundamental mechanisms of poultry diseases, UD researchers develop recombinant vaccines that combat current and emerging infectious diseases in poultry, thus preventing catastrophic losses. In an outreach effort, UD Poultry Diagnostic Laboratory monitors for diseases in poultry and assesses the effectiveness of vaccination programs.

Plant health is critical to soybean growers, and two new potentially yield-reducing plant diseases have been identified in Delaware: sudden death syndrome in soybeans and wheat streak mosaic virus. Knowing that these diseases are present allows UD scientists and Extension to mount research and educational efforts to prevent these plant diseases from becoming serious problems for Delaware growers.

Current pickling-cucumber harvesting methods fail to remove much dirt and cause excessive product damage so an innovative farming technique was needed. UD researchers, working closely with Extension, have constructed a pickling-cucumber harvester that reduces dirt on the final product by 12 percent, while the innovative redesign of the conveyer decreases product abrasion by 5 percent, thus economically benefiting both grower and vegetable processor.

UD researchers have evaluated the effect of chemical treatment of poultry litter with alum (aluminum sulfate) on phosphorus mobility. Their findings supply critical information for this important broiler-growing region concerning fate, transport, and bioavailability of toxic metals and contaminants, enabling Extension to offer growers scientifically sound and cost-effective strategies.

UD researchers conducted field trials on farms throughout Delaware to demonstrate the value of "starter" fertilizer on corn across soils with a wide range of initial soil test phosphorus levels, to show the value of poultry litter applied at various rates, and to demonstrate the value of diagnostic tools for better nutrient management during crop production. UD Extension's long-term goal is to increase Delaware farmers' awareness of the economic value of poultry litter as a source of nutrients in crop production, thus

minimizing the environmental problems associated with over-application of poultry litter to cropland.

F. MULTI-STATE EXTENSION ACTIVITIES

UD Extension often reaches across state lines to Extension staff at other universities for a wider distribution of information. These states include all those on Delmarva (DE, MD, VA) as well as PA and NJ. The following examples of multi-state Extension activities touch on some of these programs, which also may be contained in other goal sections of this report.

Farm business management skills are taught through programs of the Northeast Center for Risk Management Education (serving New England states, New York, New Jersey, Pennsylvania, Maryland, West Virginia, and Delaware). This center was established at the University of Delaware to educate producers of agricultural products about the range of risk management opportunities available to them in order to maintain profitable businesses.

MAAREC (Mid-Atlantic Apiculture Research & Extension Consortium) is a five-state consortium (DE, MD, NJ, PA, and WV) of university research/Extension, state regulatory and beekeeper associations, charged with keeping bee colonies healthy, thus meeting regional pollination demands, and ensuring agricultural profitability.

Coordinated research and data gathering by the Southeast Pennsylvania IPM group (which UD Extension participates in) has allowed Extension specialists to pinpoint proper monitoring windows for a number of ornamental insect pests.

To reduce loss from crop insects, weeds and diseases, Extension and researchers from the University of Delaware, the University of Maryland/College Park, Rutgers University, and Virginia Tech collaborate on compiling comprehensive Pest Management Recommendation Guides for regional field crops and for vegetable crops. The information is specific to local climate, soils and conditions, comparing the effectiveness of treatments for specific weed, insect, and crop diseases based on data derived from university trials.

The Mid-Atlantic Crop Management School is an excellent example of a multi-state (Delaware, Maryland and West Virginia) and multi-agency (university, NRCS, and Department of Agriculture) program that provides new educational information. Designed to provide continuing educational opportunities for Certified Crop Advisers, Nutrient Management Consultants, agency personnel (NRCS, Conservation Districts, and Cooperative Extension), independent consultants, and growers, the school provides valuable, applied information to improve incomes in farm and rural communities.

UD Extension and Rutgers University share a herd of 300 cows: 200 heifers and 100 milking cows. UD maintains a milking herd and heifers are raised at Rutgers until just

before first calving. The reason for combining the herds is better and more efficient use for teaching, Extension outreach and ruminant nutrition studies.

G. MULTI-STATE RESEARCH

DSU and the University of Delaware participate in numerous multi-state research projects in support of our State Plan of Work. We will highlight the impact of two of these projects: the Claude E. Phillips Herbarium and NC228, Avian Respiratory Diseases: Pathogenesis, Surveillance, Diagnosis and Control.

The Claude E. Phillips Herbarium consists of a 110,000 specimen vascular plant collection from around the world that dates back to 1799, 2500 volumes dating back to 1737, and numerous periodicals and photographic slides. The herbarium cooperates with many federal, state, and private institutions, including the Natural Resource Conservation Service, the Delaware Department of Natural Resources and Environmental Control, the Delaware Nature Society, the Herb Society of America, and The International Herb Association. This resource is available to students, farmers, public service agents, members of the scientific community, and the public.

The goals of NC228 are to determine the pathogenesis and interactions of specific avian respiratory disease agents, determine the occurrence and consequences of agent and host variation on disease susceptibility, and develop new and improved methods for the diagnosis, prevention, and control of avian respiratory agents. Delaware scientists are sequencing the *Mycoplasma synoviae* genome and studying the relationship between attenuation and intracellular invasiveness for mycoplasma species. In addition, Delaware scientists have examined differences among infectious bronchitis isolates and have been able to better understand the derivation of emerging isolates of this important and costly pathogen.

Participants in NC228 are located in Alabama, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Maryland, Minnesota, North Carolina, and Ohio.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities

Institution: University of Delaware
State: Delaware

Check one: __x__ Multi-state Extension Activities
____ Integrated Activities (Hatch Act Funds)
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures		Projected Budget		
	FY 2001	FY 2002	FY2003	FY2004	FY 2005
Goal 1: An agricultural system that is highly competitive in a global environment	**149,977**	**238,720**	**152,097**	**152,097**	**152,097**
Goal 2: A safe and secure food and fiber system	**11,044**	**17,578**	**11,200**	**11,200**	**11,200**
Goal 3: A healthy, well-nourished population					
Goal 4: Greater harmony between agriculture and the environment	**85,605**	**136,258**	**86,815**	**86,815**	**86,815**
Goal 5: Enhance economic opportunity and quality of life for Americans	**68,465**	**108,977**	**69,433**	**69,433**	**69,433**
Total	**315,091**	**501,533**	**319,545**	**319,545**	**319,545**

Robin W. Morgan **March 1, 2003**
Director **Date**

Form CSREES-REPT (2/00)

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities

Institution: University of Delaware
State: Delaware

Check one: ____ Multi-state Extension Activities
__x__ Integrated Activities (Hatch Act Funds)
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures		Projected Budget		
	FY 2001	FY 2002	FY2003	FY2004	FY 200
Goal 1: An agricultural system that is highly competitive in a global environment	**305,551**	**219,476**	**309,870**	**309,870**	**309,870**
Goal 2: A safe and secure food and fiber system					
Goal 3: A healthy, well-nourished population					
Goal 4: Greater harmony between agriculture and the environment	**19,162**	**13,763**	**19,433**	**19,433**	**19,433**
Goal 5: Enhance economic opportunity and quality of life for Americans					
Total	**324,713**	**233,239**	**329,303**	**329,303**	**329,303**

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Director **Date**

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Institution: University of Delaware
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Check one: ____ Multi-state Extension Activities
____ Integrated Activities (Hatch Act Funds)
__x_ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures		Projected Budget		
	FY 2001	FY 2002	FY2003	FY2004	FY 2005
Goal 1: An agricultural system that is highly competitive in a global environment	**141,684**	**215,065**	**150,479**	**150,479**	**150,479**
Goal 2: A safe and secure food and fiber system	**10,321**	**15,665**	**10,962**	**10,962**	**10,962**
Goal 3: A healthy, well-nourished population					
Goal 4: Greater harmony between agriculture and the environment	**80,002**	**121,434**	**84,968**	**84,968**	**84,968**
Goal 5: Enhance economic opportunity and quality of life for Americans	**72,417**	**109,924**	**76,913**	**76,913**	**76,913**
Total	**304,424**	**462,088**	**323,322**	**323,322**	**323,322**

Robin W. Morgan **March 1, 2003**
Director **Date**

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