

Annual Report of Accomplishments and Results

Maryland Joint Extension and Research Report

on the

Maryland Joint Extension and Research Plan of Work

As Submitted July 15, 1999

For

Fiscal Year 2006

Ending September 30, 2006

Maryland Cooperative Extension
Maryland Agricultural Experiment Station
College of Agriculture and Natural Resources
University of Maryland
College Park, MD 20742

and

School of Agricultural and Natural Sciences
Agricultural Experiment Station
University of Maryland Eastern Shore
Princess Anne, MD

April 1, 2007

Submitted for the designated institutions by:

Michael Raupp

*Interim Associate Director,
Maryland Cooperative Extension
University of Maryland
1200 Symons Hall
College Park, MD 20742
301.405.2907
301.405.2963 (FAX)
mraupp@umd.edu*

Carolyn Brooks

*Dean and Research Director
School of Agricultural & Natural Sciences
University of Maryland Eastern Shore
3004 Richard Hazel Hall
Princess Anne, MD 21853
410-651-6072
410-621-3550 (FAX)
cbbrooks@umes.edu*

Summary

This document constitutes the Annual Report of Accomplishments and Results for the fiscal year 2006 (October 1, 2005 to September 30, 2006) for the research and extension activities in Maryland subject to the Agricultural Research, Extension and Education Reform Act of 1998. This includes activities of the Maryland Cooperative Extension, a joint enterprise of the University of Maryland and the University of Maryland Eastern Shore, the Maryland Agricultural Experiment Station and the research activities at the University of Maryland Eastern Shore.

Accomplishments are reported for the five goals of the US Department of Agriculture as required. The report is organized as follows:

Part A. Planned Programs

- | | |
|--------------------|---|
| REE Goal 1. | To Achieve an Agricultural Production System that is Highly Competitive in the Global Economy |
| REE Goal 2. | A Safe, Secure Food and Fiber System |
| REE Goal 3. | A Healthy, Well-Nourished Population |
| REE Goal 4. | Achieve Greater Harmony (Balance) between Agriculture and the Environment |
| REE Goal 5. | Enhanced Economic Opportunity and Quality of Life for Americans |
| REE Goal 6. | Agricultural Communications, Enhancing Customer Service/Satisfaction Information Technologies. |
| REE Goal 7. | Multicultural and Diversity Issues |

Part B. Stakeholder Input Process

Part C. Program Review Process

Part D. Evaluation of the Success of Multi and Joint Activities

Part E. Multi-state Extension Activities

Part F. Integrated Research and Extension Activities

Appendix: Tables of Resource Expenditures by Planning Goal (FORM CSREES-REPT 2/00) for:

Multi-state Extension Activities

Integrated Activities (Hatch Act Funds)

Integrated Activities (Smith-Lever Act Funds)

This report of accomplishments and results organizationally corresponds with the original plan of work submitted in 1999. The plan of work can be found at the following web site:

<http://www.agnr.umd.edu/intranet/plan99/powoutline.htm>

Parts B-F repeat some of the working from the original plan of work for clarity of presentation. Comments and explanations on the Accomplishments and Results added for this report are shown in *bold italics* in Parts B-F. Each section of this report begins on a separate page.

Part A. Planned Programs

Outline of Example Programs

REE Goal 1. To Achieve an Agricultural Production System that is Highly Competitive in the Global Economy

1.1. Adopt management practices for agriculture production that improve profitability and increase efficiencies

- Project 1.1.1. Integrated Beef Cattle Research and Education Project
- Project 1.1.2. Monitoring Approaches and Alternative Control Tactics to Facilitate IPM for Landscape Plants
- Project 1.1.3. New Approaches to Environmentally Sound Management of Pest Insects
- Project 1.1.4. Converting Dietary Protein into Tissue Gain or Milk in Ruminants
- Project 1.1.5. Metabolic Relationships in Supply of Nutrients for Lactating Cows
- Project 1.1.6. Using Animal-harvested Forages to Increase Farm Profits
- Project 1.1.7. Vegetable and Fruit Production (New Vineyard Establishment)
- Project 1.1.8. Maryland Quality Wine Alliance
- Project 1.1.9. Managing Pests in Organic Crop Production
- Project 1.1.10. Changes in Intestinal Immune Function and Disease Resistance in Broiler Chickens Fed Probiotics
- Project 1.1.11. Sheep & Goat Production
- Project 1.1.12. UMES - Cloning a Novel Satiety Factor in Swine and its Effects on Pituitary Hormones
- Project 1.1.13. UMES - Nutritional Surveys of Uncultivated Sea Vegetables from the Chincoteague Bay
- Project 1.1.14. UMES- Sustainable Pasture Lamb Production
- Project 1.1.15. UMES-Goat and Sheep Production Support
- Project 1.1.16. UMES- Competitive Small Scale Swine Production
- Project 1.1.17. UMES-Alternative Parasite Control for Small Ruminants
- Project 1.1.18. UMES-Impact of *Bt*-Expressing Transgenic Corn on the Corn Earworm in Soybean
- Project 1.1.19. UMES - Integrating Season Extenders in Alternative Crop Development on the Delmarva
- Project 1.1.20. UMES - Environmentally Conscious Precision Agriculture - A Platform for Active Learning and Community Engagement

1.2. Adopt improved farm business management and marketing strategies

- Project 1.2.1. The Dairy Analysis Program
- Project 1.2.2. Farm Profitability & Marketing

1.3. Increase the use of appropriate production and marketing strategies for high value products

- Project 1.3.1. Major Program Area: Small Farm Profitability
- Project 1.3.2. Production of Alternative Crops with Value-Added Enhancements

1.4. Increase the investment in agricultural human capital

Project 1.4.1. Community Leadership – Public Leadership Development

1.5. Facilitate informed debates of public issues concerning the neighborhood effects of agriculture, such as nuisance concerns and environmental impacts.

Project 1.5.1. Close Encounters With Agriculture

Project 1.5.2. Managing Growth in an Urban State

REE Goal 2. A Safe, Secure Food and Fiber System

2.1. Decrease the number of Maryland citizens at risk for insufficient food availability to meet nutrient needs

Project 2.1.1. Multi-County. Expand Food Safety Skills and Practices to Citizens.

Project 2.1.2. EFNEP Helps Limited-Income Families Choose Healthy and Nutritious Foods.

Project 2.1.3. EFNEP County Example

Project 2.1.4. FSNEP Program Helps Maryland Residents at Risk for Insufficient Food to Meet Nutrient Needs

Project 2.1.5. FSNEP County Example

2.2. Improve consumers' knowledge and practice of safe food

Project 2.2.1. UMES - Development of Predictive Models for The Survival of *Campylobacter jejuni* on Chicken as a Function of Temperature

Project 2.2.2. Neighborhood GRIME Watch

Project 2.2.3. A County Example

2.3. Improve the knowledge and practice of safe food production and handling by commercial and public food industry

Project 2.3.1. On-Farm Food Processing Course

Project 2.3.2. Seafood Safety for Industry

Project 2.3.3. Real-time Response Biosensor for *E. coli*

Project 2.3.4. Surveillance Program to Monitor Antimicrobial Resistance in Foodborne Pathogens.

Project 2.3.5. Spatial Control of Biological Agents

Project 2.3.6. Improvement of Thermal and Alternative Processes for Foods

Project 2.3.7. UMES - Characterization of Antibiotic-Resistant *Salmonella* spp. Isolated from Processed Poultry

Project 2.3.8. UMES - Education Program for Improving Food Safety on the Delmarva Peninsula

Project 2.3.9. UMES - Safe and Sustainable Production of Sheep and Goat Meat

REE Goal 3. A Healthy, Well-Nourished Population

3.1. Improve Maryland citizens' knowledge and practice of healthy diet and nutrition behaviors

- Project 3.1.1. Nutrition and Wellness education designed to improve quality of Life Among Residents – A County Example
- Project 3.1.2. Diabetes Nutrition education in rural Western Maryland
- Project 3.1.3. Healthy Life Styles for Youth – A County Example
- Project 3.1.4. Childhood Obesity Prevention
- Project 3.1.5. Nutrition, Health and Fitness for Youth
- Project 3.1.6. Wellness Works

REE Goal 4. Achieve Greater Harmony (Balance) between Agriculture and the Environment

4.1. Improve the application and adoption of land-applied biosolids, manure, composted materials, and other organic byproducts.

- Project 4.1.1. Nutrient Management Program
- Project 4.1.2. Low Phytate Soybeans Increases Poultry Nutrition and Reduces Manure Phosphorus

4.2. Improve water quality through the adoption of sound environmental stewardship practices by the public and municipalities.

- Project 4.2.1. Private Well and Septic System Management
- Project 4.2.2. Deep Row Biosolid Application to Grow Trees
- Project 4.2.3. MD Master Gardeners Program (Volunteers Help Home Gardeners Reduce Pesticide Use & Improve Water Quality)
- Project 4.2.4. Greenhouse Integrated Pest Management
- Project 4.2.5. Home & Garden Information Center
- Project 4.2.6. UMES-Greenhouse Propagation and Site Technologies for Restoration of Submerged Aquatic Vegetation in Coastal Bays

4.3. Maintain a water supply capable of supporting both commercial and private needs today and in the future by protecting and conserving surface and ground water resources.

- Project 4.3.1. Improve Water Quality Through Water Conservation – Baywise landscape management
- Project 4.3.2. Improve Water Quality – Environmental Stewardship

4.4. Maintain a water supply capable of supporting both commercial and private needs today and in the future by protecting and conserving surface and ground water resources.

- Project 4.4.1. Intensive Nutrient Management for Efficient Crop Production
- Project 4.4.2. Constructed Wetlands for Treating Dairy Wastewater
- Project 4.4.3. Management Systems to Improve Economic and Environmental Sustainability of Dairy Enterprises.
- Project 4.4.4. Animal Manure and Waste Utilization, Treatment, and Nuisance Avoidance for a Sustainable Agriculture
- Project 4.4.5. Anomalous Soil Hydromorphology
- Project 4.4.6. UMES- The Use of Gypsum-Based By-Products to Improve Management of Phosphorus Losses from Soil

- Project 4.4.6.b. UMES - The Effect of Phosphorus and Nitrogen-Based Manure Management on Soil and Runoff Phosphorus
- Project 4.4.7. UMES - Development of National and International Standards and Performance Specifications for Protective Clothing Materials
- Project 4.4.8. UMES - Reduction in Animal Waste Pollution Through the Use of Enzymes to Improve Phosphorus Digestion
- Project 4.4.9. Characterizing Soybean and Corn Genotypes for Phosphorus Hyperaccumulation
- Project 4.4.10. UMES - Direct Incorporation of Poultry Litter into No-Till Soils to Minimize Nutrient Run-Off to the Chesapeake Bay
- Project 4.4.11. UMES - Controlling Odor and Nutrient Losses to Surface Runoff, Groundwater and Air with New and Conventional Manure Injection Technologies on No-Till Soils

4.5. Promote the use of rural and urban forest stewardship practices to maintain a sustainable forest resource.

- Project 4.5.1. Protecting and Profiting From Forestlands - Forestry Correspondence Course

4.6. Improve fish and wildlife habitat and species diversity, as well as promote the use of new management techniques that will manage wildlife and control damage to property, crops, and people.

- Project 4.6.1. Reforestation at Western MD 4-H Center
- Project 4.6.2. Coverts Program
- Project 4.6.3. UMES - Reference Collection of Fish Biodiversity

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

5.1. Enhancing Rural Economic Opportunities

- Project 5.1.1. UMES - Developing Rural Economic Strategies

5.2. Adopt effective and responsive policies and programs; Increase ability of Extension faculty to lead Public Issues Education programs; Increase the abilities of Extension volunteers to successfully carry out Extension programs;

- Project 5.2.1. Managing Growth in an Urban State-Strategic Planning for Jurisdictions and State Agencies

5.3. Adopt effective leadership practices; Increase leadership ability of Youth, Adults, Extension Personnel

- Project 5.3.1. Developing Community Leaders - LEAD Maryland
- Project 5.3.2. Baltimore City 4-H Teen Corps Leadership Program
- Project 5.3.3. Teen Ambassador Program—2003-2006
- Project 5.3.4. Environmental Science and Outdoor Education for Youth

5.4. Strengthen skills and knowledge to achieve economic stability and financial wellness

- Project 5.4.1. Maryland Cooperative Extension Personal Finance Seminar for Professionals.

Project 5.4.2. Money Management Programs – A County Example

5.5. Develop and accept individual, parental, home, financial, and/or community responsibility through work, family and community involvement.

Project 5.5.1. Parent and Family Development

Project 5.5.2. Maryland Cooperative Extension Child Care Provider Training.

Project 5.5.3. 4-H After-School Initiative

Project 5.5.4. 4-H After-School – A County Example

Project 5.5.5. 4-H After-School – Building Wonder in Math and Science

5.6. Enhance the attractiveness of Maryland youth to potential employers to enable youth to be productive, contributing members of a global society; Increase the ability of Maryland youth to have caring relationships with family members, peers, and others in their communities; Increase the abilities of Maryland youth to be competent youth leaders with a strong commitment to civic and social responsibility; Strengthen Maryland youth’s understanding of the importance of good health and safe and healthy lifestyles.

Project 5.6.1. Adventure in Science, Baltimore City

Project 5.6.2. Adventure in Science, Montgomery County

Project 5.6.3. 4-H Animal Science Program

5.7. Youth Development - Character/Ethics Education

Project 5.7.1. Reading out to At Risk Audience

5.8. Youth Development - Jobs/Employment, Workforce Preparation

Project 5.8.1. For Integrating Technology Into Every Day Practice

REE Goal 6. Agricultural Communications, Enhancing Customer Service/Satisfaction Information Technologies.

Project 6.1.1. UMES - Establishing a Geospatial Information Technology Training Center for Minority and Other Student Audiences-Phase II

Project 6.1.2. UMES - Geospatial Technology Academic Infrastructure Enhancement

REE Goal 7. Multicultural and Diversity Issues

Project 7.1.1. UMES -Developing an Ornamental Option for Under-Represented Students

Project 7.1.2. UMES - Broadening Perspectives: Educating Under-Represented Youth about Food and Agricultural Sciences through Experiential Learning

Part A. Planned Programs

REE Goal 1. To Achieve an Agricultural Production System that Is Highly Competitive in the Global Economy

Overview

There are 12,200 farms in Maryland, covering 2.1M acres; 1.5M acres are devoted to crops. Total land area in Maryland is 6.7M acres, with 62,700 employed. Maryland farms are typically small and farmland is expensive. With 169 acres, the average farm in Maryland is the 10th smallest in the nation. The estimated market value of land and buildings per acre is \$2,911, the fifth most expensive in the nation. Even though Maryland has one of the most progressive Land Preservation Programs in the nation, three times more farmland is lost to development every year than is preserved. Between 1950 and 1999, the number of farms and acres of farmland has fallen 66 percent and 48 percent, respectively.

Total annual gross farm income in Maryland averages 1.7B dollars, with \$220M in exports. The important commodities are poultry and eggs, nursery and greenhouse (fastest growing industry), dairy and milk products, feed/food/oil crops, meat animals, and vegetables and fruit. On average, the net income per farm in Maryland is \$33,036, while off-farm income averages \$20,000. Slightly more than half of the farmers describe farming as their principal occupation. A small percentage of agricultural producers are responsible for the majority of agricultural sales. Farms with gross market sales exceeding \$100,000 represent 21 percent of Maryland farms by number, but their sales represent 86 percent of the total sales. Crop damage from deer and geese is estimated at \$17 M annually.

The first inventory of Maryland's "green industry" indicated it has a value in sales of \$1.15 B making it the second largest agriculture industry. This industry employees 15,000 and involves 10,000 acres.

The equine industry's first census indicated 87,000 horses, mules and donkeys are in Maryland. This industry employs 38,000 people and involves 685,000 acres. Maryland's equine inventory is valued at \$680M (\$7,810/animal) and the value of all equine related assets at \$5.2 B, with \$766 M in related expenditures annually.

Maryland's principal agricultural advantage is location to markets. Grain farmers benefit from proximity to the regions poultry industry. Fruit, vegetable, dairy, beef, swine, horticultural products, and other specialty crops are sold to the five million people in the Washington-Baltimore region.

Maryland farmers are older and aging, reflecting a national trend. Maryland farmers average 55.8 years of age, compared to the U.S. average of 53.3. Maryland residents demonstrate a strong tendency to purchase locally grown commodities and value-added products, support local farmers, and preserve open space. These residents want to preserve and protect such natural resources as the Chesapeake Bay, so environmental concerns about agriculture play an increasing and significant role in the operation of Maryland farms. Maryland's poultry industry produces the largest dollar value in production and exports a substantial portion of its production.

The primary goals are:

- Adopt management practices for agriculture production that improve profitability and increase efficiencies.
- Adopt improved farm business management and marketing practices.
- Increase the use of appropriate production and marketing strategies for high value products.
- Increase the investment in agricultural human capital.
- Facilitate informed debates of public issues concerning the neighborhood effects of agriculture, such as nuisance concerns and environmental impacts.

Outputs

For REE Goal 1, Maryland Cooperative Extension educators developed 850 programs in 23 counties, Baltimore City, three regions of Maryland, state, multi-state, and national. Topics covered included best management practices, business planning, alternative agriculture, livestock, crop production, small farms, organic production systems and sustainable agriculture. These programs reached 55,148 people.

Outcomes and impacts were measured in individual programs. Examples of these are in the following section.

Maryland's own assessment of accomplishments. Maryland Cooperative Extension is accomplishing the goals of their five-year report. There is a balance of educational programs among the various goals and the Extension Administration Team is pleased with the accomplishments. Evaluations of outcomes from the five-year plan are conducted at the individual program level, not at the level of an aggregated REE goal.

1.1. Adopt Management Practices for Agriculture Production that Improve Profitability and Increase Efficiencies

(Key Themes – Agricultural Competitiveness, Animal Health, Animal Production Efficiency, Grazing, Innovative Farming Techniques, Ornamental/Green Horticulture, Plant Health, Plant Production Efficiency, Precision Agriculture)

(Key Themes from Goal 4: Biological Control, Integrated Pest Management, Sustainable Agriculture)

The Maryland Agricultural Experiment Station supports over 100 faculty and over 100 graduate students. Research is conducted both in the laboratory as well as at 9 research farms located off the main campus. Much of the research supported by the Maryland Agricultural Experiment Station has focused upon protection of the Chesapeake Bay. Nearly 40% of all research supported is directly related to the protection and restoration of resources of the Bay. The other major focus within this goal is the maintenance of profitable agriculture in an urban environment. Maryland farmers are under extreme pressure from a growing population. Issues such as land preservation, food safety and sustainable agriculture are high priorities.

Examples of research projects include the following:

Project 1.1.1. Integrated Beef Cattle Research and Education Project

a. Project Statement. The integrated beef cattle research and education project includes research and demonstration efforts aimed at improving the efficiency, profitability and sustainability of beef cattle production.

Exploring the Use of Ultrasound: A comprehensive assessment of the use of ultrasound technology is underway to evaluate carcass composition in live beef cattle. The goal of this work is to develop a rapid and accurate method to assess key carcass traits in the live animal, improve the accuracy of selection for superior breeding cattle, and reduce carcass variation at the time of processing.

Year-Round Grazing Systems: A comparison of pasture and forage production systems to provide extended and year-round grazing opportunities for beef cattle. This includes the combined use of adapted cool and warm season grasses and inter-seeded legumes to extend the grazing season and provide adequate nutrient flow for all classes of beef cattle.

Assessing Emerging Animal Health Technology: An evaluation of the efficacy and economics of emerging animal health products. Studies have been conducted on the impact of a new sustained release dewormer on growth performance of nursing beef calves and on the efficacy of a complete metaphylaxis program to control bovine respiratory disease in recently weaned feeder cattle.

Cryptosporidium research at Wye Research and Education Center: The broad subject of research in our lab is water quality in the Chesapeake Bay and the impacts on public health. Specifically, we study an intestinal parasite called *Cryptosporidium*, which is capable of infecting many kinds of wildlife and domestic animals, as well as humans. The parasite is shed in fecal material and may be washed into the Chesapeake Bay by surface runoff during heavy rains or flooding. This is a public health issue because if humans ingest the parasite, it can cause significant gastrointestinal illness, while infections in people with compromised immune systems, like AIDS patients, can be fatal.

b. Impacts.

- Earlier and more accurate selection of breeding cattle resulting in significantly reduced whole herd production costs (\$300-\$350/head) compared to traditional post weaning growth evaluation practices.
- Earlier and more rapid assessment of key carcass characteristics associated with added value in beef breeding bulls and heifers.
- Reduced cash feed costs at all stages of the beef production cycle equivalent to a savings of \$60 to \$140 per head per year.
- Improved rate of weight gain and feed efficiency in growing calves with subsequent savings of \$18 to \$21 per head per year.

- Reduced morbidity and mortality in young growing beef calves with an overall improvement in production efficiency and profitability.
 - Research focused on improved methods of early selection will reduce the number of head needed to provide future breeding stock thereby reducing feed needs, waste production and land use by individual beef producing units. Improvements in growth rate, feed efficiency and product (carcass) composition will result in a more consumer friendly product produced more efficiently at a reduced cost. The use of alternative feedstuffs and improved use of pastures and forage will reduce animal competition for human foods such as grains. Advances in the control and maintenance of animal health will reduce the therapeutic use of animal health products, improve beef quality assurance and increase consumer confidence in the safety and integrity of the food supply.
- c. **Source of Funding:** Maryland Agricultural Experiment Station, Private Donor Support.
- d. **Scope of Impact:** National.

Project 1.1.2. Monitoring Approaches and Alternative Control Tactics to Facilitate IPM for Landscape Plants

a. Project Statement. This research develops management approaches that reduce the reliance on synthetic pesticides to manage insect pests in landscapes and nurseries. We have investigated the roles of fertilization, irrigation, exposure to sunlight, colonization, vegetational complexity and the impact of natural enemies in contributing to the pest status of the azalea lace bug on azaleas. Fertilization, irrigation, exposure to sunlight and colonization events contributed little to the population dynamics of this pest. Vegetational diversity and natural enemies are the major determinants of the status of this insect as a pest in landscape habitats. A second project evaluates boxwood cultivars for their levels of resistance to the boxwood leafminer. This project was conducted at the US National Arboretum and Longwood Gardens and significant levels of resistance to the boxwood leafminer were detected. The mechanism of resistance appears to be antibiosis rather than antixenosis or tolerance. An evaluation of pheromone lures was performed for clearwing borers common in the mid-Atlantic region. A checklist of borers caught by commercially available lures was completed. Several formulated biological control agents are under evaluation in nursery and landscape settings.

b. Impacts.

Economic. By understanding the effect of vegetational diversity on pest occurrence landscapes can be designed to reduce the potential for pest populations to reach outbreak levels. This in turn reduces the maintenance costs associated with landscape management. By producing boxwood that are resistant to their major insect pests nursery growers can realize a significant competitive advantage. Consumers who use these resistant cultivars lower their maintenance costs. Plant growers and landscape managers who use pheromone traps will treat clearwing borers in a more efficacious manner thereby reducing losses in production and maintenance. Using microbial

biological agents reduces the reliance on synthetic pesticides in nurseries and landscapes.

Product Quality. Product Quality is improved through pest resistant landscape design, use of resistant plant cultivars, and pinpoint application of insecticide treatments will result on better plant quality.

Environmental. Reduced use chemical insecticides to produce plants and maintain landscapes will reduce adverse impacts on beneficial insects and non-target organisms found in nurseries and landscapes. Reduced insecticide inputs reduce the risk of environmental contamination in the sensitive ecosystems surrounding the Chesapeake Bay.

Human/Animal Health. A reduction in insecticide sprays to control insect pests reduces exposure of humans and animals to dangerous insecticides thereby reducing health risks. The use of biological control agents instead of these insecticides further reduces risks to animals and humans.

Social. Maintaining the beauty of landscape plants increases the aesthetic quality and value of home, commercial, and institutional landscapes.

c. Source of Funding: Hatch Project MD-H-188.

d. Scope of Impact: National.

Project 1.1.3. New Approaches to Environmentally Sound Management of Pest Insects

a. Project Statement. There is a continuing, urgent need for development of environmentally sound measures for the management of insect pests. This research will explore a variety of aspects of insect biology, in searching for new ways of suppressing pest populations to develop new methods of insect pest control not based on chemical pesticides.

b. Impacts. We have studied the pathogenicity of a genetically altered insect pathogenic fungus (*Beauveria bassiana*) against the coffee borer beetle (*Hypothenemus hampei*). An efficient transformation system was developed based on resistance provided by the bar gene to the herbicide glufosinate ammonium. This was used to produce genetically modified derivatives carrying the *Metarhizium anisopliae* Pr1A protease gene and the *Aequorea victoria* gfp green fluorescent protein gene or the gfp gene insert alone. Pathogenicity tests of the GFP transformant against *H. hampei* showed no significant differences with the wild-type strain. In contrast, transformed strains containing the protease gene demonstrated increased kill rates against *H. hampei*. However, proteolytic activation of the insects prophenoloxidase system reduced sporulation on cadavers of *H. hampei* and *Galleria mellonella*, providing a degree of biological containment. The results indicate that pr1A transformed *B. bassiana* can be used as an improved biocontrol agent against the coffee berry borer. This work will contribute to the development of effective yet environmentally sound new methods of controlling pest insects.

c. Source of Funding: Hatch.

d. Scope of Impact: National and International

Project 1.1.4. Converting Dietary Protein into Tissue Gain or Milk in Ruminants

a. Project Statement. Although ruminants convert human inedible plant material into high quality human edible food, they are very poor at converting dietary protein and energy into tissue gain or milk. This is a particular problem in ruminants fed forages and grasses where production is low and the efficiency of depositing dietary nitrogen into animal products may reach only 15%.

b. Impacts. The overall goal of this project is to investigate two aspects of ruminant metabolism that may contribute to nitrogen inefficiency: 1) amino acid and energy metabolism by the gut tissues and 2) urea recycling. The ability to identify the critical control points and regulators of these processes has great potential to improving the efficiency and production of ruminants. This research will lend itself to the development of feeding strategies that optimize performance and reduce nutrient wastage in ruminants.

c. Source of Funding: Hatch.

d. Scope of Impact: International.

Maryland Cooperative Extension educators developed 365 programs that were held in 23 counties, Baltimore City, three regions in Maryland, statewide, multi-state, and national. Topics covered were best management practices for plant, poultry, and animals systems; geographic information systems and biotechnology; optimizing pasture and forage resources on the farm; economically sound alternatives that mitigate runoff of nutrients and pesticides from the farm; composing and the use of nutrient management plans on small farms. These programs reached 27,224 people.

Project 1.1.5. Metabolic relationships in supply of nutrients for lactating cows

a. Project Statement. The inefficient utilization of dietary nitrogen by ruminants is a major contributor of animal wastes to environmental pollution. Studies indicate that one area where the ruminant wastes nitrogen (amino acids), and energy, is the high metabolic activity of the gastrointestinal tract (GIT). The purpose of this project is to identify the metabolic and regulatory pathways that contribute to the high catabolic activity of the GIT of ruminants, and to quantify the influence of dietary substrate supply on these pathways.

Conversion of plant protein to animal products rarely exceeds 15% in the growing ruminant and 25-30% in the high performance dairy cow. Poor growth rates of ruminants results partly from the wastage of nitrogen as ammonia absorbed from the reticulorumen and partly from the poor efficiency of utilization of amino acids (AA) appearing in the portal vein (0.25 to 0.60). The latter may result from an imbalance in the pattern of supply of AA to productive tissues (e.g., muscle, mammary gland). There

are two potential contributors to this imbalance. Firstly, there is the imbalanced AA composition of microbial protein compared to the net AA requirements for muscle and milk protein synthesis. And, secondly, there is the selective and preferential use of AA by the gastrointestinal tract (GIT) during first-pass absorptive metabolism and then again following re-circulation and extraction from the arterial blood supply. Production efficiency in ruminants fed forage only rations can be improved by supplementing concentrate, but the underlying mechanisms are poorly understood. Forage diets are characterized by high rates of ammonia and low rates of propionate absorption. We believe that under these conditions turnover of GIT proteins is increased, and the balance of these substrates attenuates nitrogen metabolism and stimulates oxidative pathways across the GIT, creating a metabolic sink for glutamine and glucose, and other AA. In this proposal, we will use a combination of cell culture and arteriovenous measurements to 1) determine the metabolic pathways regulating ammonia, glucose, glutamine and general AA metabolism by the GIT, 2) determine the effects of high (high ammonia) and low (low ammonia) forage diets on protein turnover and proliferation of the GIT and 3) determine the influence of N-carbamoyl glutamate (an activator of nucleic acid synthesis and the ornithine cycle) on ammonia absorption, ureagenesis and glucose and glutamine utilization and protein turnover by the GIT. Metabolism of stable and radio-isotope labeled ($^{13}\text{C}/^{14}\text{C}$, ^{15}N) substrates by isolated cells in culture and across the GIT in vivo will be monitored. The overall findings should help in identifying feeding, supplementation or other (e.g. gene targeting) strategies aimed at reducing GIT losses and improving overall production and economic efficiency of ruminants, especially by animals fed mostly forage-based rations.

b. Impacts. Conversion of plant protein to animal protein products is <15% in beef cattle and 25-30% in dairy cows. In consequence, ruminants excrete a large portion of feed protein as waste into the environment. This research documents that ruminants metabolize certain essential amino acids more than others, and that this contributes to an imbalance in amino acid supply for growth and milk production. The current results also document that there is a large potential for ruminants to salvage nitrogen for microbial protein synthesis and absorption, so long as conditions within the ruminant gastrointestinal tract are optimal for microbes to utilize the nitrogen arising from urea recycling. Determining the optimal fermentation conditions within the rumen for microbial capture of nitrogen is essential to formulating diets that improve feed conversion efficiency and reduce the contribution of ruminant wastes to the environment.

c. Source of Funding: Hatch, state general funds, and Multistate NC-185

d. Scope of Impact: National and International.

Examples of educational programs include the following:

Project 1.1.6. Using Animal-Harvested Forages to Increase Farm Profits

a. Project Statement. This program was initiated in 1995 using on-farm pasture walks and discussion groups. Classroom and conference teaching was added to the curriculum in 1996 to complement the on-farm module. The goals are to increase farm profitability

through the reduction of farm expenses and to attract the next generation to the farm by improving the farm family's quality of life. The program targets operators of small dairy farms (100 cows or less) and replacement heifer managers of large dairy farms. Since 1995, 64 Pasture Walks have been conducted, reaching 1,943 participants.

Eighty-One Washington County Dairy and livestock producers participated in pasture walks through which they learned improved management techniques for selecting and implementing alternatives in forage production and feed management systems. Two farms have entered into the grant funded program to convert a total of 90 acres of crop land into pasture. Each farm was provided with seeding recommendations and one has planted their acreage and the other plans to plant in spring of 2007. In addition fifty-two small and part-time farmers learned new pasture management techniques through two pasture management seminars.

- With workshops, tours and presentations, over 5,140 people have been reached since this program was initiated.
- Approximately 10% of the farms in the region use management intensive grazing as part of their feeding system.

b. Impacts. Based on the five-year average financial data from 30 Maryland farms, of which 10 are grazing operations, graziers have a higher profit per hundred pounds of milk sold (\$3.96 vs. \$2.25), per cow (\$534 vs. \$440), and for the farm (\$48,239 vs. \$47,366) compared to confinement operations. This is done with fewer cows (90 vs. 108) and less milk per cow (13,500 lbs. vs. 19,600). Graziers have reported very strong testimonials as to their improved quality of life.

In 2005, a \$435,500 grant was secured in cooperation with the Maryland Department of Agriculture to be used as incentive payments to farmers switching to grazing and to conduct grass variety trial research. During 2006, approximately 75 acres of cropland was converted to permanent pasture on two young producers' farms in an effort to increase their grazing practices. An additional 300 acres have been mapped and await approval for acceptance into the USDA EQIP program. This 300-acre farm will be a new conversion to grazing as the farm converts the 400-cow confinement system to a 250-cow grazing system.

2006 also marked the year when our second organic dairy became certified and began shipping certified organic milk. As dairymen become comfortable using management intensive grazing, it becomes relatively easy to convert to organic production, thereby providing them with the opportunity to sell their milk for nearly double the price of conventional milk. Several additional farms in the county are currently in the transition phase of the organic certification.

Grass variety trial work has been done at the Western Maryland Research and Education Center since 1999. In 2006, new plots were established with 14 annual species, 7 Italian species, and 27 perennial species planted in replicated plots. These new plots are the first of their kind in the nation where the seed is planted using a broadcast seeder as opposed to rows, thus more closely simulating real farm pasture establishment techniques. Plots will be harvested over the next three years to measure dry matter yield and persistence under a simulated intensive grazing management system.

c. Source of Funding: Smith-Lever 3B&C and state general funds.

d. Scope of Impact: Multi-County Specific.

Project 1.1.7. Vegetable and Fruit Production (New Vineyard Establishment)

a. Project Statement. New vineyards are established throughout the state in the most efficient and economical manner. Entrepreneurs utilize proper site selection, ground preparation, establishment techniques, and make educated variety choices to get new venture off to efficient start.

b. Impacts. Worked with 115+ entrepreneurs at various stages from discussion, planning, establishment, and expansion of new vineyards. Through formal educational programs, personal site evaluations, and conversation, vineyards were planned and establishes in the most efficient and economical manner, including proper site selection, ground preparation, establishment techniques, and variety choices to get new venture off to efficient start. There was an estimated 20 acres planted at an average cost of \$7,000 per acre for a total addition of approximately \$210,000 to the Maryland agricultural economy. A greater increase is anticipated in the future.

To assist producers make planting decisions, a GIS/ GPS site suitability mapping tool was developed in cooperation with the MD department of planning. This vineyard suitability map project is available in 22 MD counties. These new GIS/GPS Site Suitability Maps were used to do preliminary evaluation of sites; grant money was obtained to expand maps for 2007. A web site revamped to include base information: Site selection, bio-renovation, establishment, variety choices; Links to information from other states in the region; Hardcopy of presentations from the “Beginners Grape Grower Workshops”; “Timely Viticulture” series of Newsletters.

Four “Beginners Grape Grower Workshops,” (2 in-state; 2 regional out-of-state). In-state programs conducted in Keedysville (Western) attracted 35 participants and in Hughesville, attracted 80 participants. Two on-REC field days conducted with over 100 total participants and two on-farm twilight meetings conducted with over 80 participants. Programs demonstrated proper establishment practices, early vine training, training systems, and variety performance in the region. Fifteen site visits accomplished throughout state to assist new growers.

c. Source of Funding: Smith-Lever 3B&C, state general funds, and Tri-County Council

d. Scope of Impact: Multi-State and Multi-County Specific

Project 1.1.8. Maryland Quality Wine Alliance

a. Project Statement. Establish a MD Quality Wine Alliance (MDQWA) for the Association of Maryland Wineries to evaluate and set a quality standard designation for commercial MD wines, and set minimum quality standards for all wines produced in the state bearing the designation. The evaluation sessions are conducted 4 times annually.

b. Impacts. Four evaluation sessions were conducted and the 15 commercial wineries were provided with objective analysis and constructive criticism of strengths and weaknesses of wine and how to improve. One specific event resulted in the saving of 1200 gallons of wines that were “saved” as a result of observations of flaws followed by and instructions on how to correct. Since this program was initiated over 5,000 gallons of wine were saved. As part of the program, four educational sessions relating to specific timely viticultural and enology topics were conducted – see teaching. Fruit quality in the vineyard (extremely challenging vintage due to wet conditions) and wine quality improved as the result of the program Managing Pests in Organic Crop Production.

c. Source of Funding: Smith-Lever 3B&C and state general funds.

d. Scope of Impact: Multi-state and multi-county.

Project 1.1.9. Managing Pests in Organic Crop Productions

a. Project Statement. Organic crop production is one of the fastest growing segments of Maryland agriculture. Organic farmers strive to manage arthropod pests by a combination of cultural and biological strategies. Pesticides are used only as a corrective tool to resolve specific pest problems. Unlike conventional pesticides, the effectiveness of these products is not well documented by scientific experimentation. There has been limited research directly focused on organic production systems throughout the United States, including Maryland.

University of Maryland scientists and extension educators in cooperation with colleagues at the Maryland Department of Agriculture, conducted on-farm studies to evaluate the effectiveness of inoculative releases of Mexican bean beetle parasitoids in combination with the use of a trap crop and neem-based bioinsecticides. Results indicate that an early season trap crop of snap beans followed by releases of parasitic wasps can suppress pest populations below damaging levels. Field tests also identified several new insecticides that are effective and economically feasible for control of problematic insect pests in organic crop production.

In the 2006 growing season within an organic vegetable production system augmentation of the Tachinid fly, *Trichopoda pennipes*, for the control of squash bug, *Anasa tristis* on squash was achieved using floral attractants. In areas with floral attractants numbers of adult *T. pennipes* increased by 38.2% while the rate of parasitism of the squash bug was 55.9% greater compared with areas without floral attractants. Yields in the floral areas were 24.7% greater as compared with areas without floral attractants.

In 2007 an experiment integrating a biopesticide, *Beauveria bassiana*, and organic pesticides was conducted on strawberries for control of aphids. *B. bassiana* worked best when combined with diatomaceous earth (DE), controlling 95.2% of the aphid population. Used alone *B. bassiana* controlled 31.5% of the aphids while DE controlled only 22.6%. None of the other organic pesticides alone or in combination controlled a significant percentage of aphids compared with the control.

b. Impacts. Organic crop production can provide a profitable alternative for new farmers and a means of enhancing profitability for conventional farmers. This project provides effective and environmentally compatible management strategies that minimize organic crop losses. Results will have a major impact on the sustainability of organic production and allow for market expansion by Maryland organic growers. The project also will leverage additional funding from public and private sources to support a long-term organic research and educational program for Maryland.

Over 1,066 farmers and researchers learned about organic cover crop selection and management at 18 events; including a professional development conference, an organic research twilight tour, and a regional sustainable agriculture conference. Extension field faculty serve as a member and vice chairman of the Maryland Organic Certification Advisory Committee (appointed by the Secretary of Agriculture). This group focuses on policy issues regarding organic certification of the 78 certified organic farms (encompassing over 3,500 acres) and retailers in Maryland. Other efforts included teaching 45 Master Gardeners techniques of organic gardening. The advanced topics in organic and sustainable practices program attracted 42 participants to learn about topics including organic transition systems, weed control and farm budgeting.

Three county AGNR agents attended a 12 day SARE sponsored advanced training in organic crop production program in 2005/06 and initiated the development of a statewide organic production systems educational program.

c. Source of Funding: Hatch Act, Smith-Lever 3(b) & (c), special research grants and State funding, 1890 Extension.

d. Scope of Impact: Multi-county and Multi-State.

Project 1.1.10. Changes in intestinal immune function and disease resistance in broiler chickens fed probiotics

a. Project Statement. To prevent an economically important intestinal disease caused by parasites, chicken producers rely on the use of drugs. Over time and use, the parasites may become resistant to the drugs. This research will investigate the use of products containing beneficial live bacteria (e.g., *Lactobacillus*, as found in yogurt) as possible enhancers of the chicken's natural defenses (intestinal immune system). If intestinal immunity is improved, producers may be able to reduce their use of anti-parasitic drugs.

b. Impacts. There are four primary impacts of this project. First, the work confirms for intestinal immune function what others have shown for general immunity concerning

the negative impact of vitamin A deficiency. Within this confirmation, however, is a process (the deficiency) which consistently produces predictable adverse effects at the intestinal level. This feature can be used in constructing comparisons with processes believed to enhance immunity. Second, using the model employing vitamin A deficiency, a commercially available probiotic product based mainly on viable species of Lactobacillus was shown to enhance intestinal immune function, specifically in the face of an economically important parasitic disease, and to provide some relief from the damage caused by vitamin A deficiency. Third, in birds not facing vitamin A deficiency, the improvement of intestinal immune response against this parasite was confirmed. Further, the various components measured of the immune system had results consistent with the concept that the pathogen was more effectively controlled within the intestine and did not colonize the gut wall as easily or completely as it did without the probiotic. Finally, the protective role of a benign microbial additive in chicken feed on immune function offers one way in which commercial chicken producers may reduce dependency on antibiotics for prevention of infectious disease in chickens.

c. **Source of Funding:** Hatch Act

d. **Scope of Impact:** Multi-state, National, International

Project 1.1.11. Sheep & Goat Production

a. Project Statement. Producers will implement management practices that maximize their profitability and/or quality of life, while minimizing environmental and animal welfare impacts.

b. Impacts. MD Extension agents have taught classes out-of-state with over 1100 producers and extension faculty in attendance. Over 600 MD residents attended sheep and/or goat educational programs, conferences, workshops, and short courses.

- The demand for sheep and goat meat is low compared to other meats, but it is relatively high among persons of specific ethnic/religious backgrounds (e.g. Muslim, Hispanic, Greek Orthodox, and Caribbean). Sheepgoatmarketing.info is being developed as a national resource on sheep and goat marketing, with special emphasis on the ethnic/religious markets. The goal of the web site, which was moved to Maryland in 2004, is to link buyers and sellers, using an interactive, database-driven system. It consists of a producer directory, marketing directory, market inquiries, calendar of events, and educational links. The web site is now fully functional. As of 12/31/05, there were 599 producers in the producer directory. Testimonials indicate that the web site is helping producers to find buyers for breeding stock and direct market their slaughter animals. For example, a sheep producer with 700 ewes was able to establish a business relationship with a processor in Connecticut. A goat producer credited 15 sales with his listing in the directory.
- Internal parasites (gastro-intestinal worms) are the primary health problem affecting sheep and goats and represent a major obstacle to profitable production. The purpose of this program is to teach producers a more integrated

approach to managing parasitism in their flocks/herds. Four-hour workshops are held to introduce producers to tools that will help them manage their flocks, including fecal egg analysis and FAMACHA©. Since 2004, 20 workshops have been held in 7 states. Over 759 producers, extension agents, and youth have been certified in the use of the FAMACHA© system (204 were certified in 2006). An additional 451 individuals were introduced to IPM techniques at programs where hands-on training was not possible. Since 2004, 27 IPM workshops have been held in 10 states. 7 workshops were held in 2006. Producers as increased their knowledge of parasites and parasite control by 30 to 40 percent as evidenced by pre and post-test acres. Producers who have taken the IPM training indicate that they are using the FAMACHA© system to make deworming decisions. They are deworming their animals less often. Many producers have introduced other IPM techniques such as fecal egg analysis, multi-species grazing, and genetic selection for parasite resistance. According to a follow up survey conducted in 2006, 74 percent of producers are deworming their animals less often; none are deworming more. 57 percent of producers are experiencing fewer parasite problems in their herds; 40 percent characterize their problems as about the same; none worse. 91 percent of producers are using the FAMACHA© system to monitor animal health and making deworming decisions. 69 percent of producers spent less money on anthelmintics in 2006 compared to the previous year. Producers are adopting various other IPM practices: fecal egg analysis, 13.2%; fecal egg counting, 28.9% DrenchRite testing, 7.9%; mixed species grazing, 31.6%; browsing, 52.6%; increasing grazing height, 36.8%; reducing stocking rates, 28.9%; nutritional supplementation, 65.8%; zero grazing, 13.2%; breed selection, 47.4%; genetic selection, 57.9%; periparturient treatment, 63.2%; switch to oral dosing, 23.7%; weighing animals to determine proper dosage, 36.8%; planting a tanniferous forage, 2.6%, and pasture rest/rotation, 71.1%.

- The Maryland Small Ruminant Page was established in 1998 to serve as an information portal for sheep and goat producers. A web-based survey conducted in 2004 indicated that 100% of the persons using the web site had found information on the web site that helped them manage their sheep and goat flocks/herds. 90% of respondents had found information that saved them money or increased their profits. Sheep 101 and Sheep 201 are the newest additions to the web library. Both web sites are oriented towards youth and beginning producers. Pages from these web sites have been printed off and used in beginning shepherd classes. Both the Maryland Small Ruminant Page and Sheep 101 (and 201) are listed as references on many other web sites and in many publications. When you type “sheep” and “goat” into Google™, the Maryland Small Ruminant Page is ranked #1. In fact, all of the web pages rank high when you conduct Google™ searches for information pertaining to sheep and/or goat production.

c. Source of Funding: Smith-Lever 3B&C, state general funds and SARE Chapter 3

d. Scope of Impact: Multi-State and multi-county.

Project 1.1.12. UMES - Cloning a Novel Satiety Factor in Swine and its Effects on Pituitary Hormones

a. Project Statement. Previous research has shown that urocortin may be able to impact appetite and growth hormone secretion without causing a stress response in rats and pigs, so urocortin or related hormones (such as antagonists) have been studied by other researchers as possible treatment of obesity and other health problems in humans. It might also be used in modulating growth and carcass quality (fat content) in pigs or could also influence reproduction. Therefore, a more comprehensive study of this peptide was undertaken beginning with cloning of a partial DNA sequence and an attempt to characterize its expression, as well as the study of its influence on hormone secretion directly at the level of the pituitary. A collaborator briefly screened a porcine cDNA library with mouse primers and had no positives. The cloning efforts started at the University of Maryland Eastern Shore (UMES) in collaboration with the Department of Natural Sciences identified both urocortin 1 and 2 partial gene sequences in pig DNA, but failed to discover urocortin 3 in the pig. RT-PCR was conducted for mRNA presence and was found in some swine tissues. Two UMES doctoral level graduate students conducted biotechnology-based research in efforts to get a cDNA sequence for pig urocortin and conducted a preliminary pituitary cell culture experiment with USDA-ARS collaborators. The graduate students have transferred those techniques through training each other and other graduate students and through teaching biotechnology techniques to three undergraduate summer internship students and 4 undergraduate students at UMES. A mammalian primary cell culture lab was established at UMES, culture procedures were developed and an experiment conducted that indicates that urocortin does influence reproductive hormones at the level of the pituitary in pigs, but in a positive, not negative manner as might be expected of a stress-related hormone. The project has continued because a student found information about the research on the UMES website, became interested in the work and began graduate work to continue the line of research. New, modern biotechnology equipment was purchased and scientists and students from many areas have used it and continue to use it in research and teaching. Students in biology, plant science and animal science as well as microbiology have all used the updated equipment/facilities.

b. Impacts. Research and teaching capacity was expanded by the addition of new, modern equipment to biotechnology laboratories in two areas and through the establishment of a mammalian cell culture lab (along with procedures for swine pituitary cell culture). Two new scientists (one in Natural Sciences, one in Food Science) and their graduate and undergraduate students were able to utilize these laboratories along with existing scientists in Agricultural Sciences. This expanded the biotechnology experiences and research possibilities for students and scientists and expanded collaborative research. For the first time known, a partial DNA sequence for urocortin was identified in the pig. Students were trained in new research techniques at different institutions and then developed the procedures and trained more students at UMES, increasing the research capacity of this University and training minority students in modern techniques to allow them to be more competitive in the workforce. Novel information about this hormone was obtained using the developed techniques and updated laboratories/equipment that could potentially impact human health (through treatment of obesity or depression) as well as enhance swine production (growth/reproduction).

c. Source of Funding: CSREES- Capacity Building and Evans Allen.

d. Scope of Impact: National.

Project 1.1.13 UMES - Nutritional Surveys of Uncultivated Sea Vegetables from the Chincoteague Bay

a. Project Statement. Sea vegetables, often called seaweeds, are photosynthetic, multicellular, macroalgae with ecological and economic uses. Unlike Asia, where sea vegetables have been traditionally used as food, seaweed research in the west has concentrated more on taxonomy, systematics, and ecology. Few studies have addressed detailed nutritional benefits and antioxidant properties of individual sea vegetable species. There is a need for continued, comprehensive research on “organic” and “natural” foods to develop increased awareness of the long-term benefits of consumption of nutrient-rich seaweeds that also have antioxidant, antimutagenic, and anticoagulant properties besides enhancing thyroid function, prevention of birth defects and cardiovascular diseases. The overall goal of this project is to advance the body of knowledge in applied natural sciences and human nutrition through initiating research on nutritional surveys of some of the abundant sea vegetable species in the Chincoteague Bay with the hope of opening avenues for applications of these nutrient-rich algae for food and nutraceutical products. Through this project, public awareness on seaweed farming will be promoted, and will help communities to be aware of the fact that sea vegetables that are sometimes acting as “nuisance species” for seagrasses and other aquatic species, could actually be transformed into new cash crops and could generate many new job opportunities for the local and regional people on the Delmarva Peninsula, thereby contributing to the economic development of the region. Seaweed harvesting and processing will help many aquafarmers in coastal areas of the Delmarva Peninsula where alternative employment is scarce. By combining research and outreach, the project can provide needed enhancement of the Nation’s food and agricultural research system.

To achieve the objectives of the project, proximate compositional analyses were conducted to determine moisture, ash, fat, protein, and dietary fibers in species representing all the three groups of seaweeds (*Gracilaria tikvahiae*, *Ulva lactuca*, and *Fucus vesiculosus*) over a period of two years. Samples were collected seasonally along with water quality data using a multiparameter YSI unit. The proximate composition in seaweeds varied with water quality suggesting that biochemical composition could vary with changing environmental conditions. Besides proximate composition, other analyses such as vitamins, minerals, omega-3 and omega-6 fatty acids, and flavonoids were conducted in the above mentioned species in collaboration with Covance Lab in Minnesota, and USDA in Beltsville, MD. Results show that the three species have omega-3 and omega-6 fatty acids, and are rich in vitamins A, C, D, E, and K. Flavonoids were not detected in any of these species. In collaboration with Emory University, Atlanta, Georgia, Solid-state ¹³C NMR spectra from these three species of seaweeds were compared to determine variations in the overall chemical composition of different taxonomic groups of seaweeds. Although minor differences were detected in peak intensities, the spectra from the three species exhibited high degree of similarity.

As beneficial roles in the ecosystem, seaweed communities provide an array of resources for many organisms, especially marine invertebrates and other microalgae. Various epifaunal and epifloral species were characterized from the seaweed communities. The study supported that brown seaweed, *Fucus* has added advantages over other groups to support the growth of various epifauna and epiflora. Metal pollution in aquatic ecosystems can pose a major environmental concern impacting various life-forms in the system. The usefulness of seaweeds as biomonitors or indicators of metals in the coastal bays of the Delmarva Peninsula is highlighted in this study, conducted in early spring 2006. Lack of any preexisting data on metal loads in Delmarva seaweeds and in the ambient medium (water and sediments) led to this pilot study for preliminary investigations on the ecological health of these coastal bays. The seaweed species collected from three different sites of the Delmarva Peninsula were: phaeophytes *Fucus vesiculosus*, and *Fucus gardneri*, chlorophytes *Ulva lactuca*, and *Enteromorpha intestinalis*, and rhodophyte *Gracilaria tikvahiae*. The sampled seaweeds, seawater, and sediments were subsequently analyzed for chromium, manganese, cobalt, nickel, copper, lead, arsenic, and zinc. The results exhibited high concentrations of Mn and low concentrations of Cu in almost all the species. Bioconcentration factors (BCFs) in *Ulva lactuca* and *Fucus vesiculosus*, across sites, were similar (though the orders of magnitude varied) for Cu, Zn, and Ni. Calculation of Metal Pollution Index (MPI) and Tomlinson Pollution Load Index (PLI) displayed that all the three sites had low contamination with respect to the metals investigated.

b. Impact. There is an increased awareness of the long-term benefits of consumption of natural foods that are rich in antioxidant, antimutagenic, anticoagulant, and obesity-preventing properties. Development of a seaweed industry positively impacting the economy. Research findings on natural foods like seaweeds will impact millions of Americans who are suffering from obesity, cardiovascular diseases, and other health-related problems, as they become more aware and include these edible seaweeds in their diet. Outreach efforts to the community through the Fall Edible Algae Symposium impacted more than 100 people, as 95 percent felt that seaweed education was important and should be integrated in K-16 curricula, and also seaweeds should form an integral part in people's diets.

Studies from this interdisciplinary project have been important in reaching aquafarmers in the Delmarva region on the importance of seaweed harvesting as a business to reduce the abundance of macroalgae that consume too much oxygen leading to fish kills and other environmental problems. Two doctoral students in the MEES Graduate Program are examining the seasonality of the nutritional composition of seaweeds and determining seaweeds' ability to absorb the elemental sources of water pollution. One M.S. student has graduated in Fall 2006 with specialization in *Fucus* ecology. This project continues to create awareness of the importance of seaweeds as possible alternative sources of nutrition and health products to the local and regional communities through brochures, dissemination (articles) in the Daily Times, and in the news of television channels. Collaborations have been established among faculty from various disciplines (Chemistry, Food Science, Microbiology, Biology, and Environmental Science) at UMES and also between UMES and USDA, and UMES and Emory University, Atlanta, GA. Research presentations were made at the International Botanical Congress in Austria, Vienna, and at other national conferences (Botanical

Society of America). The project received international recognition through publication in “BUSINESS DAY HEALTH NEWS”, in South Africa.

c. Source of Funding: CSREES- Capacity Building.

d. Scope of Impact: Delmarva Peninsula/National. International

Project 1.1.14. UMES- Sustainable Pasture Lamb Production

a. Project Statement. The number of sheep being produced is increasing nationally, with the number of breeding sheep increasing in the past years for the first time in many years. There is potential for the production of faster growing more efficient crossbred animals in a more sustainable manner to boost this industry. Currently, most producers are raising traditional meat-wool crosses in a dual-purpose type of system. With the decline in demand for wool and increased desire for healthier, safer “pasture-raised” meat, there is now a need to focus on producing heavily muscled meat animals that can be raised in a low input, pasture-based production system. Promoting the use of Katahdin hair sheep ewes and a terminal sire ram to provide high quality pasture raised lambs will improve lifestyle satisfaction for producers by providing acceptable profits, while also enhancing the environment and protecting community values. In addition, communities benefit from having more small farms in business, and the availability of healthier meat choices.

b. Impacts. Three experiments have been conducted at UMES with a fourth in progress. Results have been published as peer-reviewed abstracts and presented at National scientific meetings as well as in the Maryland Sheep and Goat Newsletter (over 300 viewers). Several farmers have requested use of sire breeds demonstrated at the UMES studies and a few have already started their on-farm studies. One organic farmer/producer completed a comparison study in Year 1 and continued the study in Year 2 because of his satisfaction with the first years’ results. Workshops were conducted on parasite control methods (IPM) and ultrasound. Over 40 workshop attendees have been exposed to sustainable parasite control information and over 300 readers have been exposed to sustainable agriculture research and have been exposed to the SARE (Sustainable Agriculture Research and Education) program. Four new producers are raising crossbred sheep on pasture using one of the sire breeds or types demonstrated in the research at UMES. Four new producers have conducted on-farm research. Three producers applied for on-farm SARE grants in different areas of sustainable agriculture interest. Five new producers are using sustainable parasite control methods (such as checking eye-lid color and rotational or multi-species grazing) that reduce the amount of chemical de-wormers needed.

c. Source of Funding: CSREES-NE SARE (Sustainable Ag Res & Ed) and 1890 Extension.

d. Scope of Impact: National, international and regional.

Project 1.1.15. UMES-Goat and Sheep Production Support

a. Project Statement. Small ruminant (goat and sheep) production is a growing alternative agricultural enterprise, especially in the east. Small ruminants are ideal for small acreages and offer farmers/producers a chance to make a profit without excessively high input costs. In addition, the increasing immigration of ethnic populations preferring goat and/or sheep meat means that demand for meat products from these animals will continue. Currently, much of the meat satisfying the demand is imported. Therefore, there is a vast opportunity for local and national producers to profit from this alternative enterprise.

b. Impacts. Several workshops have been hosted; personnel have spoken at several local, state and regional small ruminant production workshops/seminars, including one in Jamaica. Several research and demonstration grants were funded, a directory was implemented for producers (collaboration among MCE personnel throughout the state), hair sheep and meat goat research was conducted at UMES and on producer farms. Several newsletter articles were written. Twelve farmers bought goats/hair sheep to add onto their current farming enterprise. Surveys indicated that producers agreed that they would change something about their lifestyle, management styles or farm operations to improve their business or satisfaction based on information presented at workshops or seminars. The majority of respondents also indicated that they would like to see more small ruminant programs offered. Two producers who were direct-marketing beef and/or pork began to sell lamb produced cooperatively. A meat/animal marketing cooperative was discussed and a group auction was held and group purchasing (scales, etc.) was conducted.

c. Source of Funding: 1890 Extension, NE SARE (CSREES) and RDC.

d. Scope of Impact: State, regional national and international.

Project 1.1.16. UMES - Competitive Small-Scale Swine Production

a. Project Statement. Although the number of swine on the Delmarva Peninsula has dramatically decreased, small producers are still trying to find methods to maintain their viability in this industry. Increasingly, swine producers have focused on low-input, alternative, sustainable production systems for swine such as outdoor production systems or production for specialty markets (i.e. BBQ pig market, freezer meat, show animal sales). These types of systems are more likely to be profitable in the current local environment.

b. Impacts. Training has been (through workshops) and continues (through one-on-one training) to be offered on artificial insemination in swine. Several articles have been written in a regional newspaper, a 4-H swine project program was previously conducted and a marketing collaboration was discussed with local livestock/meat producers. Over 1/3 of the 4-H youth involved in the swine 4-H market hog project continued with the project longer than 2 years and the number of youth showing swine at the local 4-H fairs increased by 50%. The quality of swine exhibited at the local fairs has increased (as communicated by the judges of the shows). Three producers have shared their experience in alternative production (outdoor) and in specialty markets (BBQ pigs/freezer pork). Three new local consumers were convinced that freezer pork was more cost efficient than retail pork and have since contacted local farmers about

purchasing freezer pork. One local producer learned artificial insemination and information about direct marketing and developed her own label and is marketing value-added products (direct marketing pork) at local Farmers' Markets.

c. Source of Funding: 1890 Extension.

d. Scope of Impact: State, regional national and international.

Project 1.1.17. UMES - Alternative Parasite Control Methods for Small Ruminants

a. Project Statement. Small ruminants are ideal for small acreages and offer farmers/producers a chance to make a profit without excessively high input costs, however control of internal parasites is a growing, costly problem in small ruminant production, especially in the South and Northeast. Chemical dewormers are quickly losing their effectiveness and no new ones are planned. Therefore, in order to maintain sustainability of small ruminant production enterprises, and decrease chemical dewormers in the environment, alternative, sustainable control methods for internal parasites are needed.

b. Impacts. One research experiment has been conducted at UMES with several others planned with the help of a farmer/producer consulting group. Products to be tested included potential natural dewormers such as high tannin grain sorghum and possibly garlic. Workshops are planned on parasite control methods (IPM), including eye control testing for treating only those animals needed, pasture rotation, multispecies grazing, etc.

c. Source of Funding: CSREES-NE SARE and 1890 Extension

d. Scope of Impact: National, international and regional.

Project 1.1.18. UMES-Impact of *Bt*-Expressing Transgenic Corn on the Corn Earworm in Soybean

a. Project Statement: On the Lower Eastern Shore of Maryland and throughout eastern Virginia, at least one-third of the total soybean acreage is treated annually with insecticides to control this pest, at a total cost of nearly 2.5 million dollars. CEW populations build up on soybean later in the growing season as the preferred corn crop matures. Insecticides provide satisfactory control of podworms if proper spray coverage is achieved at the right time. Field scouting and the use of economic thresholds are currently deployed in integrated pest management programs to prescribe insecticide treatments. However, most treatments are applied aurally at low spray volumes to accommodate the need to quickly treat large acreage during an outbreak. As a result, numerous control failures have been reported, presumably related to a lack of adequate coverage or poor timing. In short, many approaches have been devised for the control of podworm; however, insecticides are still the mainstays and soybean growers continue to incur significant losses. In the mid-Atlantic states, corn and soybean are rotational crops grown in close proximity spatially and temporally.

Preliminary studies have shown that YieldGard hybrids delay corn earworm development and may reduce the number of pupating larvae by more than 60%. More extensive field trials are needed to evaluate the performance of these moths as potential colonizers of soybean. Several questions remain unanswered: will CEW moths that

survive *Bt* corn contribute to podworm infestations in soybean? It is clear that certain hybrids of *Bt* corn suppress ear infestations of CEW; however, whether planting of these resistant hybrids close to soybean field will result in area-wide suppression of CEW is unknown. If these resistant hybrids significantly reduce the development and reproductive potential of CEW, they offer tremendous potential for not only providing a viable alternative control in corn but may have far reaching impacts on soybean and other host crops attacked by the same pest. The plan of work for 2007 growing season include the following. Three *Bt* corn hybrids and their non- *Bt* isolines will be planted in a randomized complete block design using four replications at UMES and LESRIC during July, 2007. At the end of season, while the cobs are at milk stage, corn earworm larvae will be collected during their final instar stages from the ears of different *Bt* hybrids and non- *Bt* corn isolines. The larvae will be reared in growth chambers on small pieces of cobs. The adult moths upon hatching will be exposed to various dosage levels of cypermethrin in small vials to determine the development of resistance. Lastly, larvae collected from *Bt* and non *Bt* hybrids during their final instars fro both locations will be also be kept in small cups in corn field and each cup will contain one larva of corn earworm. These cups will be covered with small buckets with labels on them. The survival rate of the larvae from *Bt* hybrids and non *Bt* isolines will give us an indication about the number of corn earworm moths which could have deposited eggs on soybean plants

b. Project Impact: The mortality percentages of adult moths will provide information on the development of resistance in *Bt* hybrids and non- *Bt* isolines against corn earworm. Significant mortality percentage of corn earworm moths observed in buckets which were kept under field conditions containing the full grown larvae collected from the *Bt* hybrids and non *Bt* isolines would provide useful information to ultimately reduce the number of insecticide sprays on soybean crop.

c. Source of Funding: CSREES - Capacity Building Grants Program

d. Scope of Impact: National, international and regional.

Project 1.1.19. UMES- Integrating Season Extenders in Alternative Crop Development on the Delmarva

a. Project Statement. Excessive amounts of poultry waste on the Delmarva Peninsula of the United States coupled with the availability of yard waste may be potential inexpensive nutrient sources for growing vegetables. At the same time, current demands for specialty or ethnic crops have been increasing due to consumer preferences, desires for alternative sources of industrial products such as medicine and oil, and pressures to diversify from tobacco production. Consequently, this creates the need to determine the potential development of alternative crops in new regions and simulated microenvironment such as those used for extending the growing season and for providing a medium in which to produce a safe food supply. Therefore this proposal seeks to study various practices for producing safe selected ethnic crops in composts during the growing and extended season on the Delmarva Peninsula. Ongoing activities include studies to determine the safety and productivity of cool season salad greens grown in soils amended with composts; and the influence of media type and moisture influence on growth and development of ginger (*Zingiber officinalis*) propagules.

b. Impacts. New knowledge was produced on the propagation of a potential specialty medicinal and spice crop, ginger in composts and yard wastes. New knowledge will be derived on the production and safety of salad vegetables in composts under high tunnels which extend the season on Delmarva. Three undergraduate students gained research experience by assisting with this project.

c. Source of Funding: CSREES- Evans Allen.

d. Scope of Impact: Regional, National.

Project 1.1.20. UMES - Environmentally Conscious Precision Agriculture - A Platform for Active Learning and Community Engagement

a. Project statement. Low enrollments in agricultural programs and sluggish response to need for program innovations coupled with the fact that the agricultural industry struggles every year to fill positions with qualified individuals does not bode well for the future of what some believe to be the nation's most important industry. "Precision Agriculture", a modern approach that addresses both production needs and environmental concerns, has provided the foundation for intense instructional and research activities at some of the 1862 Land Grant Colleges. The proposed project will focus on the following activities with a view to improve the image as well as enhance education and research in agricultural sciences and other relevant disciplines at UMES. Field work and active learning in teams will be integrated with various courses to provide hands on exposure to high-tech equipment and software to the students. Acquisition of scientific instrumentation and hardware to complement existing infrastructure for remote sensing and yield monitoring at UMES to implement all aspects precision farming in the UMES farms including variable rate application of seed, fertilizer, nutrients and other chemicals will be accomplished. This will also provide an active learning platform that will be integrated with the course and experiential learning activities.

b. Impact. The project will provide high visibility to modern high tech aspects of agriculture and applied sciences in UMES campus. It will expose all STEM majors to the field of Precision Agriculture by way of the multidisciplinary team taught course and will encourage them to pursue further studies and research in this growing field by providing summer internship opportunities at USDA and UMES. Modernizing farming practices at UMES will also get a boost. The acquired scientific instrumentation will build capacity in precision agriculture and complement the existing capabilities that allow accurate yield mapping using an UMES combine installed with a GPS unit and a yield monitor. Student participants will be assigned field projects that will provide hands on exposure to the equipment and the data they generate for scientific analysis. Approximately 15-20 students will also benefit from environmental monitoring equipment and capabilities in the UMES Marine Ecology & Environmental Sciences Lab.

c. Scope of funding: USDA, CSREES Capacity Building Grants Program

d. Scope of Impact: Regional and Statewide

1.2. Adopt Improved Farm Business Management and Marketing Strategies

(Key Themes – Agricultural Profitability, Risk Management)

Maryland Cooperative Extension educators offered 114 programs in 18 counties, Baltimore City, three regions in Maryland, state, multi-state, and national. Topics included improving profitability, liquidity, solvency of farm operations through improved record-keeping systems; increasing the use of information systems; improving short and long-run business planning; managing agricultural enterprises through a better understanding of tax policies, federal programs, and other federal/state policies; and reducing financial risks through forward pricing, crop insurance mechanisms, and diversification of farm level enterprises. These programs reached 8,200 people.

Examples of educational programs include the following:

Project 1.2.1. The Dairy Analysis Program

a. Project Statement. *Farm Financial Management.* The objective of this program is to help Maryland farmers improve their business management skills to improve management productivity, increase profitability, and fulfill their long-term goals. It is accomplished through workshops, seminars, and individual on-farm consultations involving farm business management, strategic and tactical planning, record keeping, financial analysis and computer applications for farm managers, educators, lenders, and others. Workshops and seminars are prepared and conducted at the request of, and in teamwork with Extension Educators, Specialists and others. This program has a major focus on dairy farms and small farms. Currently, 43 farms participate in this program. The program involves adaptive research on business planning techniques, crop and livestock enterprise analysis, farm machinery economics, crop insurance, computer use in agriculture, economics of alternative agricultural enterprises and economics of sustainable agriculture methods. The program is also carried to the College Park campus through the AREC 306 Farm Management course. The program methods and results are described below.

b. Impacts. *Business Planning for Maryland Agribusinesses* - This method was developed in 1998 and continued through 2006. The objective is to provide managers of commercial farms, small farms, greenhouses, and nurseries with education and assistance in developing effective business plans for their businesses. A business plan is a set of detailed written documents that will help them manage their operations in the short-term and long-term. It is an organized collection of all the important ideas that include mission statements, annual goal statements, resource inventories, marketing plans, production plans, financial plans and business structure plans. A business-planning seminar has been presented to a total of 700 farmers as part of the Frederick County Small Farm education series since 1996, with 18 participating in 2006. The Dairy Analysis program (1997-2005 data) shows dairy grass managers net \$103 more per cow per year than conventional MD dairy farms.

In addition, a *Dairy Farm Management Program* was developed. This method provides specific financial and business planning tools to Maryland dairy farm managers. Analytical tools have been developed to help dairy Farm Managers manage their

operations. The *Maryland Dairy Farm Business* summary is a major component of this program. In this summary, dairy farmers are taught how to use their IRS Schedule F tax forms to analyze the financial condition of their farms. The information on their tax schedules is converted to a per cwt basis so that they are able to see the specific strengths and weaknesses of their businesses. They are also able to compare their businesses with other dairy farms in Maryland and in the northeast to identify their strengths and weaknesses. All farmers participating in this summary show a high level of understanding of their individual financial analysis.

An evaluation was sent out to all 30 farmers who participated in 2006. Out of the 30 surveys sent out, 18 dairy farmers responded. The evaluation was anonymous. The following questions were asked in the survey. The results are reported. (Scale: 5=Strongly agree 1=Strongly disagree): I better understand the financial condition of my farm (4.7); I better understand specific strengths and weaknesses in my management (4.3); I am taking action to reduce specific expenses that I have identified as excessive (4.0)

As a result of this program the producers documented the following impacts: Analyzing feed costs, control repair expenses, lowering depreciable machinery, lowering fuel costs, Lowering seed costs, lowering feed costs, lowering repairs, lowering supplies, lowering labor, analyzing feed costs, analyzing insurance, increasing milk per cow and cattle sales, reduce buying depreciable assets, work off debt, buying in volume for discount purchases, purchasing grain at harvest for lower prices, exploring commodity feed to reduce feed costs, decrease purchased feed cost through growing more on the farm, not buying excess semen, improving breeding efficiency.

Over the long run, I have learned to manage my income and expenses to increase profitability over what it would have been if I had not participated in the summary (3.9) If you agree with the previous statement, estimate a percentage that you have increased profitability (10.4%). Eighteen producers would recommend this program to others.

c. Source of Funding: Smith-Lever 3B&C and state general funds.

d. Scope of Impact: Multi-County Specific.

Project 1.2.2. Farm Profitability & Marketing

a. Project Statement. Farming is becoming very complex, with pressure from land development, severe weather conditions, regulations and fluxuations in the markets making it difficult for farmers to make a profit. Farmers must become aware of grain marketing techniques to assist them in making a profit.

b. Impacts. Grain Marketing Educational Programs-Statewide: An Extension Team was developed, consisting of eight Extension educators/agents to deliver the Winning The Game marketing workshop adapted from the University of Minnesota. A USDA-RMA grant was secured (\$31,00.00) to operate the program. The pre harvest educational program was offered at nine locations in January and February with a total attendance of 324 farmers. One objective of the program are to have participants write and implement a grain marketing plan. Another objective is for participants to forward

price a higher percentage of their crop early in the season as prices are historically better on average. In December 2006, a follow up questionnaire was sent to 142 participants of the pre harvest educational programs. Forty individuals returned the questionnaire. Thirty-one of thirty seven developed a pre harvest marketing plan. Thirty of Thirty two indicated they had carried out the plan. Participant's percentage of grain forward contracted rose by 20 percentage points for corn, 12 percentage points for wheat and 3 percentage points for soybeans. These increases indicate participants did forward price more of their crop early in the season.

Post harvest educational workshops were offered at eight locations with a total attendance of 140 in August and December of 2006. The objectives of these workshops are 1) Have participants better understand post-harvest grain price trends, 2) Have participants better understand carrying charges and how to sell the carry, 3) Have producers better understand their own costs of storage, and 4) Have producers understand the peril of holding grain too long in storage. End of session evaluations indicated that 66 of 71 respondents agreed or strongly agreed that they better understood price trends. Fifty nine of seventy two respondents agreed or strongly agreed with having a better understanding of carrying charges. Sixty one of 71 respondents either agreed or strongly agreed they had a better understanding of storage costs. Sixty eight of 71 respondents either agreed or strongly agreed they better understood the perils of holding grain too long in storage.

c. Source of Funding: Smith Lever 3 b & c and MDA state funds.

d. Scope of Impact: Multi-County.

1.3. Increase the Use of Appropriate Production and Marketing Strategies for High Value Products

(Key Themes – Adding Value to New and Old Agricultural Products, Diversified/Alternative Agriculture, Niche Market, Organic Agriculture, Small Farm Viability).

Maryland Cooperative Extension educators offered 117 programs in 18 counties, three regions in Maryland, state, multi-state, and national. Topics included increasing access to markets by profitably selling high-quality ornamental horticultural products; practicing post-harvest handling techniques to increase product quality and improving market access; adding value to traditional agricultural products; and increasing economic bargaining power of small and part-time farmer by cooperative bargaining. These programs reached 6,138 people.

Examples of educational programs include the following:

Project 1.3.1. Major Program Area: Small Farm Profitability

a. Project Statement. Frederick County has experienced heavy urban growth. This has resulted in the loss of many traditional full-time family farms, while the number of small and part-time farms has increased in numbers. The 2002 U.S. Census of Agriculture shows that 93% of the 1,273 farms in Frederick County have gross farm incomes of less than \$250,000; the USDA definition of a small farm. Small farm operators experience problems with high purchase costs, limited access to markets, and

limited availability to fieldwork services. Small farm operators also suffer from a lack of basic agricultural knowledge, since most have little to no previous farm experience.

The Beginning a Successful Small Farm Operation educational series was developed in 1996 in Frederick County to provide an opportunity for small farm operators to obtain basic education in agriculture, marketing, and business. Since 1996, the educational series has consistently maintained a strong participation by the small farm segment of the agricultural community in Central Maryland. Between 1996 and 2006, 413 small farm operators from around the Central Maryland region have attended 13 basic farming small farm series and three specialty courses on enterprise development.

b. Impact. In early 2006 Agent initiated the idea of a Small Farm Conference to the Board of Directors of the Maryland Small Farm Cooperative. As a result, this board developed and presented the “Farmer Education and Resource Day” in November 2006, which attracted 38 farmers; this program was rated as excellent by all of those in attendance.

In 2006, 24 small farm operators from Central Maryland attended this Agent’s “Basics of Farming” course, totaling 7 classes, which were all taught by this Agent. Teaching evaluations from all of the classes were rated as excellent by the participants. This course was unique in that it was the first daytime small farm-based program. It was successful in attracting a new, predominately female audience, who would not have been able to attend an evening course.

In fall 2005 and 2006 small farm program follow-up surveys show, 65 participants rated the small farm programs as (10 = Very Helpful) *On-farm Helpfulness* of all of the classes, the average score was excellent at 8.31; the average score of *How Helpful were the Classes Taught to Your Farm Enterprise* was 8.35, this compares to *What was Your Knowledge of these Class Topics prior to the Course* 3.39. Other survey results show participants opinions: *Information You Learned in Course has helped and Continues to Help in Farm Operation* 8.87, *Utilized Information Taught* 7.43, *More Knowledgeable About Agriculture* 8.87, *More Clearly Defined Farming Operation* 7.61, and *Continue to Refer to Handout Materials* 8.90 .

A 2006 survey of 2003 and 2004 small farm series participants showed that all seventy-eight 2003 and fifty-eight 2005 participants continued to pursue farming or continued in their farming ventures in 2005 and 2006; data shows they gained confidence in their ability to develop a quality of life/successful family farm from their education experience. The fall 2006 follow-up survey showed that 20 program participants had an annual gross farm income of \$22,480 (ranging from \$0 to \$195,000).

In an innovative program effort, one hundred, thirty-eight small farm operators from Central Maryland attended one or more of the four non-traditional farm enterprise courses offered in this new 2006 Extension educational series. The courses included “Aquaculture Enterprises and Pond Management”, “Sheep and Goat Enterprises”, “Natural Resource Enterprises”, and “Free-Range Poultry Enterprises”; Agent taught the poultry courses and MCE regional specialists taught the other courses. Post-class teaching evaluations from all of the classes were rated as excellent by the participants. In a post-season follow-up survey of participants, they responded with the following:

Lectures helped you in your farm operation 8.2 (10 = Great Help), *How much of the material have you been able to utilize* 7.2 (10 = Much), *Do you feel more knowledgeable about your enterprise* 9.2 (10 = More Knowledgeable), and *Lectures helped to more clearly define your farm operation* 8.0 (10 = Much). As a result of the course, 18 participants developed a farm business plan.

c. Source of Funding: Smith-Lever 3 B & C, 1890 Extension and state general funds.

d. Scope of Impact: Multi-County Specific.

Examples of research projects include the following:

Project 1.3.2. Production of Alternative Crops with Value-added Enhancements

a. Project Statement. The Upper Eastern Shore of Maryland, also known as the corn-belt of the Mid- Atlantic, produces corn, soybeans, and wheat as its principal commodities. Recently, losses in local buying competition coupled with national overproduction of these commodities have reduced the prices received by farmers for these commodities. Data indicate that farmers are currently experiencing negative cash flows with many farmers leaving the industry altogether. If our farmers are going to become profitable, and if land and natural resources are to be preserved through a sustainable agricultural community, it is important for value-added products and new markets to be identified. Ongoing, sophisticated research is required to identify value-added products as well as locate profitable niche markets.

The Maryland Cooperative Extension (MCE) teamed with the Chesapeake Fields Institute (CFI), a 501(c)(3) organization chartered in the year 2000 to address the loss of profitability in traditional agricultural markets throughout farms. By working with local agribusiness, government officials, and community leaders, MCE and CFI have developed a plan that will result in farmers gaining knowledge and skills that will move them toward greater sustainability. The long-term objective of this project is to enable farmers to engage in the production of alternative crops through which value-added enhancements are to be achieved. MCE has assembled a team of research scientists at the University of Maryland that possess rich backgrounds in cereal chemistry, plant genetics, crop production, food science, and market feasibility. This diverse set of academic backgrounds ensures a comprehensive approach to developing value-added products and markets and has received major grants to finance the project.

b. Impacts. An effective extension mechanism integrating value-added research with field management practice has been developed. What makes this mechanism unique is the fact that farmers are involved in a research-oriented effort that will facilitate adding value to their crops. This mechanism is innovative in that it is the result of major collaborations with area farmers, extension offices, government officials, and academic institutions from all over Maryland. Subsequently, a sustainable/profitable agricultural community will emerge. The research outcomes from this project are expected to contribute to the knowledge of alternative crop production and value-added product development. Ultimately, achievement of the long-term objective will result in preservation of the land through environmentally sound farming practice that is profitable.

As a measurable outcome, this mechanism is expected to directly lead to improved and more profitable farming practices, as well as enhanced quality of life for Maryland farmers and their rural communities. The diverse research team ensures that a comprehensive approach to developing value-added products/ markets will occur. Additionally, the effective coordination of scholarly research and extension that is the cornerstone of this project is expected to lead directly to improved and profitable farming practices. This mechanism could serve as a model for enhancing quality of life for farmers and their rural communities nationwide.

In 2006, the grower base stabilized at 36 farmers from eight Maryland counties growing 5,000 acres of identity preserved crops. Growers produced over 5,000 acres of soybeans for the Japanese food market and shipped over 100 containers from Port of Baltimore. In addition grower contracted and grew crops for 2 organic food contracts and harvested 500 acres of specialty bread wheat. This group also shipped 87 containers of Natto soybeans through the Port of Baltimore to Japan in 2005/06. In 2006, the group leased a 41,000 bushel grain facility. We have worked closely with USDA cooperative technical services to incorporate and develop a business plan.

- Local restaurants begin to serve and retail Chesapeake field breads.
- Solicited 25 regional soy processors to sell locally produced grains
- Completed soy snack research initiated a marketing plan to sell soy snacks

c. Source of Funding: Smith lever 3b&c, Maryland Center for Agro-Ecology, Inc.

d. Scope of Impact: National.

1.4. Increase the Investment in Agricultural Human Capital

(Key Themes – Managing Change in Agriculture)

Maryland Cooperative Extension educators offered 52 programs in 18 counties, three regions in Maryland, state, multi-state, and national. Topics included farmers understanding issues facing agriculture and natural resources and improving their leadership skills; improving management and personnel skills; and farm families improving the transfer of management skills from one generation to the next. These programs reached 2,936 people.

Examples of educational programs include the following:

Project 1.4.1. Community Leadership (Public Leadership Development)

a. Project Statement. The world is becoming increasingly complex. People communicate more quickly, are increasingly interdependent, and turn more quickly to litigation when they are in conflict. As Maryland's communities adjust to these changes, the value of effective leadership rises. Maryland's increasing urbanization puts new pressures on it's agriculture and natural resources, at the same time that farms and agribusinesses struggle to remain economically viable, environmentally friendly, and good neighbors. To meet these challenges, leaders committed to the future of Maryland

agriculture must be able to resolve complex problems successfully in skillful, thoughtful and innovative ways.

MCE provides public leadership development programs for various communities in Maryland. Our standard practice is to provide knowledge and skills to our learners, which will help them solve future problems. We have created several programs designed specifically to increase leadership skills of participants:

LEAD Maryland, focuses on developing leaders for Maryland agriculture. This is a partnership with the University of Maryland College of Agriculture and Natural Resources, the Maryland Department of Agriculture, the Maryland Farm Bureau, the Maryland Grain Utilization Board, and the Maryland Agricultural Education Foundation.

The Water Resources Leadership Initiative (WRLI), which focuses on establishing a network of informed and effective leaders who are water resource stakeholders from public and private sector organizations. This program was discontinued in 2004, but its benefits are still felt.

b. Impacts. The long-run impacts of public leadership development programs are difficult to gauge. One indicator is that participants from prior groups in the *LEAD Maryland* and WRLI programs have continued their involvement by helping teach, host field trips, and facilitate learning events for subsequent groups. *LEAD Maryland* has attracted support from over 20 local, state and national organizations and is recognized statewide as a premier leadership program. The start-up summary of *LEAD Maryland* will serve as a reference and guide for the start up of other agriculture leadership programs. As of 2006, 96 fellows have graduated from the *LEAD Maryland* program. WRLI has graduated 70 students as of 2004, and is now discontinued.

c. Source of Funding: Smith-Lever 3b&c, state general funds and private funding.

d. Scope of Impact: Multi-County Specific.

1.5. Facilitate Informed Debates of Public Issues Concerning the Neighborhood Effects of Agriculture, such as Nuisance Concerns and Environmental Impacts

(Key Themes –Public Issue Education, Adult and Youth Development)

Maryland Cooperative Extension educators offered 292 programs in 20 counties, three regions in Maryland, state, and multi-state. Topics included increasing the knowledge of citizens to better participate in community decisions; better understanding of the role of agriculture in providing them a safe, affordable supply of food and fiber; and public officials making better informed decisions about the neighborhood effects of agriculture. These programs reached 11,785 people.

Examples of educational programs include the following:

Project 1.5.1. Close Encounters With Agriculture

a. Project Statement. *Close Encounters With Agriculture* is an outreach educational program geared toward Montgomery County fourth grade students. The program emphasizes nutrition, the environment and their inter-relationship with production agriculture. This agent served as overall chairman of the Executive Committee, coordinating the solicitation of funds, educational materials and promotional items for take home goody bags. This educator also provided leadership for the educational activities conducted in the production agriculture segment of the program and coordinated volunteer participation. Subcommittees for the environmental segment and the nutrition segment were responsible for the development and implementation of those portions of the program. The agricultural program segment consisted of five learning stations featuring live animals with hands on learning activities.

b. Impacts. A total of 2,591 students and 469 teachers participated over a 10-day period in 2006 including 1390 minority students from 29 schools. Teacher evaluations and pre/post testing were used to determine program effectiveness. Teacher evaluation scores averaged 4.89 out of 5.0 in the area of importance of topics for youth, 4.82 to indicate the interest of students in topics presented, 4.57 as to its relevance to the fourth grade curriculum, 4.86 for appropriateness of materials for age/grade of students and 4.93 for the quality of presentations. Teachers rated the overall trip as a 4.86 out of a high of 5.00 and 100 percent felt their students had a much better understanding of agriculture as a direct result of the field trip.

Pre and post tests were used to measure students' learning. On the overall pre/post test, students averaged 32 percent correct on the pre test and after program participation averaged 70 per cent correct on the post test. Students were able to answer the five questions correctly 79.8% of the time on the posttest. Seven agencies co-sponsor the event and 134 staff and volunteers delivered the program.

Volunteers donated an estimated 1090 hours for this program. According to Volunteer Sector, a coalition of leading non-profits groups, volunteer time was valued at \$17.19 per hour in 2003. Based on these criteria, the total monetary value of the hours donated to Close Encounters would be \$18,737.10.

c. Source of Funding: Smith-Lever 3b& c, state general funds and private donated hours.

d. Scope of Impact: County Specific.

Project 1.5.2. Managing Growth in an Urban State

a. Project Statement. Maryland has two regions identified as the second-most and the ninth-most threatened farming regions by an American Farmland Trust report. The Maryland Office of Planning predicts that if current trends continue, 500,000 more acres of open land will be lost to development over the next 25 years (Bay Journal 1997).

University of Maryland MAES & MCE faculty developed a multi-disciplinary research effort in the Patuxent watershed to analyze the evolution of land-use change. Their goal: to determine how policy mechanisms, land-use controls, non-point source pollution

regulations, wetland permitting and transportation affect farmland loss and residential development patterns. They also developed farmland-owner workshops on tax issues related to agricultural land preservation. MCE agents participated in 52 programs with 6,159 participants and assisted in several statewide planning events with MD. Department of Agriculture and the MD Agriculture Land Preservation Program.

b. Impacts. Additional funding granted for Farmland Protection under the 2002 Farm Bill. Increased citizen and farmer involvement in the development of comprehensive plans. Legislation introduced in Maryland House to grant tax-free easement payments. Assessment of important agricultural lands needing protection improved. Eleven MCE county faculty assisted the MD. Agriculture Land Preservation Foundation and other local land preservation groups develop forums to identify issues relating to land use policy. MCE faculty also assisted in the establishment of a Governor's Interagency Commission on Land Use.

c. Source of Funding: Smith-Lever 3b& c.

d. Scope of Impact: Multi-County Specific.

Part A. Planned Programs (continued)

REE Goal 2. A Safe, Secure Food and Fiber System

Overview

There is a need to improve food safety at all points in the food production and distribution chain. Although few data are available specifically for Maryland, the issues in our state are similar to the national issues outlined in the Food Safety Initiative. These issues affect everyone from food producers and processors to retailers, food service handlers, and consumers. HACCP (Hazard Analysis Critical Control Points) is a systematic way of implementing preventative measures to ensure food safety and includes contamination prevention, detection, and ongoing monitoring. As a part of HACCP and new food safety inspection initiatives, rapid pathogen detection and food borne illness monitoring programs will be needed from the farm to the processing plant to the retailer. Model HACCP programs for these various clientele need to be available. Extension and Experiment Station research programs need to develop better pathogen detection and monitoring techniques. The HACCP, Good Manufacturing Practices (GMP), and Sanitation Standard Operating Procedures (SSOP) requirements must be met, but the average small to medium food producer, processor, direct marketer, distributor, and retailer in Maryland will need support and training to do so.

Consumers are frequently unaware of basic tenets of food safety: the importance of cooking and storage temperatures and the need to wash hands and utensils frequently. Consequently, almost 50 percent of food borne illness is estimated to be caused by improper handling or preparation by the consumer.

The primary goals are:

- Decrease the number of Maryland citizens at risk for insufficient food availability to meet nutrient needs.
- Improve consumers' knowledge and practice of safe food handling.
- Improve the knowledge and practice of safe food production and handling by commercial and public food industry.

Outputs.

For REE Goal 2, Maryland Cooperative Extension educators developed over 300 educational programs, resulting in 1,850 educational presentations, which were held in 23 counties, Baltimore City, all three regions in Maryland, statewide, multi-state, and national. Topics covered were food insecurity and hunger, food safety for consumers and food safety for commercial enterprises. These programs reached over 12,000 people.

Outcomes and impacts were measured in individual programs. Examples of these are in the following section.

Partners in these programs included Maryland Food Council, Center for Poverty Solutions, Maryland Food Bank, Capitol Area Food Bank, Maryland Food Hospitality Education Foundation, Restaurant Association of Maryland, school systems, county health departments, the Maryland Department of Health and Mental Hygiene, county social services departments, the Maryland

Department of Human Resources, the Eastern Shore Health Education Center. Cooperation with other members of the land grant system included VA, West VA, DE, NJ, and PA.

Maryland's own assessment of accomplishments. Maryland Cooperative Extension is accomplishing the goals of their five-year plan. There is a balance of educational programs among the various goals and the Extension Administration Team is pleased with the accomplishments. Evaluations of outcomes from the five-year plan are conducted at the individual program level, not at the level of an aggregated REE goal.

UMES' commitment to a safe, secure food and fiber system has been consolidated with the construction of the new Food Science and Technology Building that was dedicated on September 12, 2003. This new building provides state-of-the art teaching and research facilities for the doctoral program in food science and technology. This facilities supports work in the following areas: identification of pathogens and spoilage microorganisms; research in food preparation and handling, product testing, and product development; analysis of food composition and research in food safety, food quality, and product shelf life; research on food handling and packaging; animal holding area; and raw product handling facilities including fast-freezing, and many other areas.

2.1. Decrease the Number of Maryland Citizens at Risk for Insufficient Food Availability to Meet Nutrient Needs

(Key Themes – Food Security, Food Resource Management)

A USDA report on Household Food Security in the U.S. indicated that Marylanders are disproportionately affected by food insecurity. 7.1% of Maryland's households were food insecure, with 40% of these clustered Baltimore City. While urban poverty is a serious issue, Maryland's rural population also suffers from serious lack of access to food resources. This issue especially affects children. Maryland Cooperative Extension educators developed at least 150 programs, which were held in all 23 counties, Baltimore City, three regions in Maryland, statewide, multi-state, and national. With a goal of increasing awareness and application of knowledge and practice of safe food handling, all nutrition education classes reflected a food safety component. Topics covered were food sources and availability, purchasing and preparation. These programs reached approximately 7,700 people. *Feeding the Community, Safely!* and *Feeding the Children, Safely!* were presented to over 2,500 participants through 70 educational programs in 16 Maryland counties during 2006.

Examples of educational programs include the following:

Project 2.1.1. Multiple Counties - Expand Food Safety Skills and Practices to Citizens

One county example:

a. Project Statement.

Feeding the Children-SAFELY! A need was identified in the child-care providers training program for food safety education, and thus *Feeding the Community-SAFELY* program underwent major revisions to meet the requirements for licensure of child-care providers. A six-person Extension team led by this educator developed the program. Evaluation materials were developed in FY 03.

Feeding the Community-SAFELY was developed to provide occasional quantity cooks, and other food handlers with safe food handling information. This educator was part of a 5-person FCS team that developed the two-hour program. Educators developed and assembled resource kits for 23 FCS county units and adapted/ developed the curriculum, helped obtain Health Department endorsement, and obtained external reviewers. The curriculum was burned on a CD and in FY 02, translated into Spanish was subsequently revised to meet the USDA guidelines for the general consumer.

b. Impacts.

Feeding the Children-SAFELY!

- The CD's were distributed to several Universities/ teachers in FY 04
- The program was used in 8 Maryland counties. Presentations were given to Head Start, Child and Adult Care Food Program Children's Resource Center, WIC, EFNEP, FSNE, and parent groups.

Feeding the Community-SAFELY!

- In FY 06, eight Maryland counties reported presenting 20 program to approximately 300 participants.
- Audiences included Welfare to Work, Food Service, State Fair, and Department of Social Services workers.
- Several Universities/ Educators requested the CD containing the package program in FY 06.

Project 2.1.2. EFNEP Helps Limited-Income Families Choose Healthy and Nutritious Foods

a. Project Statement. Hunger and food insecurity affected 11.9% of the U.S. households (or 38.2 million people) in 2004. USDA's Economic Research Service (ERS) report on Household Food Security in the U.S. (2000), indicated that Marylanders are disproportionately affected by food insecurity. In 2005-6, 7.1% of Maryland's households were food insecure, with 40% of these clustered in Baltimore City. While urban poverty is a serious issue, Maryland's rural population also suffers from serious lack of access to food resources. This issue especially affects children and female headed households.

Several MCE programs including the Expanded Food and Nutrition Education Program (EFNEP) are addressing food insecurity, in partnerships with Maryland and Capital Area Food Banks, among others. EFNEP helps its participants stretch the food dollar, make wise and healthy food choices and access other relevant public assistance programs. EFNEP works exclusively to empower low-income families in food insecure communities to meet the challenges of hunger and food insecurity.

b. Impacts: In 2006, in 9 counties and Baltimore City, 25 Extension Nutrition Assistants reached 2,400 limited resource families as well as an additional 10,751 young people in collaboration with schools, after school programs and summer

enrichment programs. Demographic, economic and program participation data was collected from all participants.

In 2005-06 Maryland EFNEP received \$721,849 in total federal funds as well as approximately an additional \$700,000 in state and county funds to address food insecurity and reduce chronic disease risk EFNEP reached 2,400 program families (8,239 family members) with its programs; 28% of these participants had an income less than half the poverty level.

EFNEP Adult Program

How Are Accomplishments Measured?

Data from the EFNEP Evaluation/Reporting System is used to measure food practices and dietary improvements. Ten key food-related practices were measured at entry into EFNEP and upon graduation. These behavior changes translate into significant improvements in daily living skills. Results based on data from 804 graduates show that:

- 90% of adults showed improvement in one or more food resource management practices.
- 94% showed improvement in one or more nutrition practices
- 80% showed improvement in one or more of the food safety practices

EFNEP Youth Program

- 92% of 3,455 youth from 63 groups now eat a variety of foods.
- 91% of 4,076 youth from 78 groups increased knowledge of the essentials of human nutrition.
- 89% of 2,205 youth from 52 groups increased their ability to select low-cost, nutritious foods.
- 79% of 3,455 youth from 63 groups improved practices in food preparation and safety.

Recent reports indicate that, for every 1% spent on EFNEP, \$10.64 is saved on health care costs related to food-borne and chronic illnesses and low birth weight babies. This corresponds to a saving of more than \$7.6 million in future health costs for Maryland.

c. Source of Funding: EFNEP Program funds—USDA Smith-Lever 3(d) and state general funds.

d. Scope of Impact: State-wide.

Project 2.1.3. EFNEP County Example

a. Project Statement: The projected outcome of this program area was to improve the knowledge and skills of health professionals related to obesity and chronic disease prevention and treatment. The need to educate other professionals is well-established since obesity rose by 57% in Maryland in the last decade. Obesity costs Maryland \$2.5

billion/year in health care expenses and lost productivity (Obesity Targeted, 2004). This provides justification of obesity education, in addition to obesity being strongly correlated to the incidence of diabetes and hypertension.

The Educator, who is viewed as the source of ongoing, reliable nutrition education for professionals, taught 15 specialized trainings to over 400 health professionals. The in-depth trainings typically averaged two hours each. Of the 15 sessions, nine were advanced diabetes and weight management trainings for physicians, dietitians, nurses, and other health professionals at hospitals, health departments, and nursing homes. Some of these were recognized trainings that provided continuing medical education credits. Another five trainings focused on food safety, supplements, and stress management.

b. Impacts. Post-test data indicated that 78% of the professional participants had a “complete understanding” of diabetes meal planning versus 14% prior to the training. One physician stated that the in-service training “reaffirmed my belief that portion control is the most critical factor” in diabetes and obesity prevention and treatment. A post-test survey revealed that 67% reported that they now had significantly improved their confidence level in assisting patients with nutrition. A nurse reported that she had a “much better understanding of artificial sweeteners, carbohydrate counting, and diabetic exchanges.” One training also focused on food safety and revealed that only 6% of participants had a “complete” understanding of the causes of foodborne illness prior to the training in comparison to 86% after the training.

When the professionals were surveyed three months after the training, 87% stated they utilized the information for patient education. It also revealed that 80% of their clients have used the information to decrease portion sizes, 67% to reduce blood glucose, and 83% to improve quality of life through diet and exercise. This type of impact from professional trainings substantially penetrates the community through the vast numbers of individuals reached. It is projected that the professionals reached an average of 70 individuals which results in 29,000 more clients being educated. If a more 1,000 clients used the strategies to prevent obesity, the result would be \$6,000 in health care savings/person (Reuters, 2004) saving \$6 M total.

c. Source of Funding: EFNEP Program Funds- USDA Smith-Lever 3(d) and state funds.

d. Scope of Impact: multi-county specific.

Project 2.1.4. FSNEP Program Helps Maryland Residents At Risk for Insufficient Food to Meet Nutrient Needs

a. Project Statement. The Maryland FSNEP is a collaborative program of FNS, UMD, and the MD Department of Human Resources, providing nutrition education to low income families in 13 Maryland Counties and Baltimore City. The goal of FSNEP is to help families improve dietary quality, increase physical activity, improve food security, develop food resource management skills, and handle food safely.

b. Impact. FY06 Contact Data

- Conducted in 17 counties and Baltimore City
- 109,277 total contacts; 49,314 adults and 59,632 youth
- 86% direct contacts and 12% indirect contacts

FY06 Qualitative Data

- 246 surveys from 9 projects
- 38% behavioral change; 28% satisfaction with program; 23% cognitive change; 9% systems change and 3% barriers

FY06 Quantitative Data

- 1,983 post/pre evaluation surveys submitted for analysis (848 submitted in 2005) from 10 projects
- 80% of participants indicating strong intent to change behavior based on post/pre assessment (53% in 2005)($p < .0001$)
- Strong significant outcomes in the following intent to change behaviors ($p < .0001$):
 - Look for ways to eat more fruits and vegetables
 - Choose lower fat milk
 - Choose lower fat meats
 - Choose lower fat snacks
 - Choose healthy snacks
 - Choose fruits and vegetables for snacks
 - Choose high fiber foods
 - Try to balance calories with food and activity
 - Use MyPyramid to plan meals or snacks
 - Choose lower fat foods when eating out
 - Choose smaller portions of food
 - Make small changes to increase physical activity
 - Include 30 minutes of physical activity in your day
 - Include physical activity during the day
 - Plan meals before making a list, before shopping
 - Use a grocery list when shopping
 - Buy generic/store brands
 - Manage money and resources to have enough food until the end of the month
 - Try new low cost foods and recipes
 - Use unit pricing to compare prices at grocery store
 - Prepare food instead of buying convenience foods
 - Choose a variety of colors of fruits and vegetables
 - Try new fruits and vegetables
 - Compare prices before buying food
 - Read grocery ads before making a list
 - Buy larger quantities to save money at the store
 - Track money spent on food each month
 - Use written budget or spending plan to meet family needs
 - Track family income and expenses
 - Use community resources to help meet food needs

- Wash fruits and vegetables before eating and/or preparing

FY06 WalkWays Data

- Submitted (n=328) (66% increase from FY05) from 4 projects.
- Significant difference between pretest and posttest stages of change (pretest mean = 2.95, posttest mean = 4.38, $t = -11.066$, $df = 132$, $p > .001$)
- The average number of average daily steps walked by participants at program conclusion was 8,974 (1945 in 2005)
- 6 month follow-up data from Garrett County indicated 47% of respondents reported continued use of pedometers; 42% reported walking about the same number of steps as at the conclusion of the WalkWays program (70.37% response rate)
- 6 month follow-up data from Carroll County indicated 100% of respondents were more physically active than before the program, 36% to 53% (depending on class site) of respondents reported continued use of pedometers; 54% - 75% (depending on class site) of respondents reporting always trying to find ways to walk more

FY06 Integrating Nutrition into the Elementary School Curriculum Data

- Pilot data collected for 4 classes from 3 projects
- Data indicated that course instructors, guest presenters and content were well received
- Class participants integrated nutrition into the classroom between 15-60 minutes per week (teachers were not segregated out in analysis from school nurses, administrators, mentors, etc)
- Class participants indicated greatest barrier to integrating nutrition into the classroom was time
- Survey instrument, curriculum and syllabus was modified based on pilot data results

FY06 JumpSmart Data

- Coordinated 3 Kangaroo Kids trainings
- JumpSmart (and Power of Choice) used in over 4% of all program sessions
- FSNE educators reached 103,485 adults (786% increase over 2004 ; 4,231 agency staff and teachers (74% increase); and 34,727 youth (20% increase). 88% of programs were direct contacts.

c. Source of Funding: FNS-USDA, MD Department of Human Resources, community collaborators, and state general funds.

d. Scope of Impact: State-wide.

Project 2.1.5. FSNEP County Example

a. Project Statement. FSNE positively impacted youth and adults through classes focused on dietary quality, food security, and food safety taught by the educator, FSNE staff and collaborators. These vital trainings were conducted in schools, agency sites, churches, etc., in the form of single classes or ongoing series. The train-the-trainer

model significantly increased the educator's efficiency as well as the audience base in 2006 to reach over 6,500 participants. In addition, over 14,000 individuals were reached indirectly through outlets such as monthly nutrition newsletters and educational materials.

The majority of the programming focused on youth with over 4,000 participants taught through Head Start and after school FSNE programs such as *Color Me Healthy*, *Jump Smart*, and the *Power of Choice*. Other audiences included mothers with young children who were taught through community agency sessions using FSNE curricula such as *Health By Design*, *SmartChoices*, and *WalkWays*. In addition to teaching food stamp eligible audiences, this program reached 500 teachers and agency staff with educational programs to assist them with conducting effective nutrition education programs.

b. Impacts. Post-then-pre-data were collected from participants with regard to their intent to change their dietary behaviors. After completing the program, 62% of participants claimed that they would begin trying new fruits and vegetables while 69% planned to choose a variety of colors of fruits and vegetables. Over one-half of the participants reported that they would choose lower fat milk and eat breakfast more regularly. With regard to exercise, 50% committed to making changes to increase their physical activity.

Data were also analyzed to determine strong significance with regard to the behavioral outcomes. Results indicated that there were statistically significant outcomes with regard to participants reading food labels before buying foods; choosing lower fat foods when eating out selecting lower fat snacks; consuming smaller portions of food; and balancing calories with activity.

c. Source of Funding: FNS-USDA, MD Department of Human Resources, community collaborators, and state general funds.

d. Scope of Impact: State-wide

2.2. Improve Consumers' Knowledge and Practice of Safe Food Handling

(Key Themes – Food Safety)

The effects of washing with 10% salt and phosphate solutions on physical, sensory, and microbial properties of frozen chicken breasts were studied. Washing chicken breast with trisodium phosphate (TSP) or sodium tripolyphosphate (STPP) significantly improved microbial, textural, and sensory properties of frozen chicken breasts.

Over 400 programs resulting in 782 presentations to over 20,000 participants took place in 2006.

Examples of educational programs include the following:

Project 2.2.1. UMES - Development of Predictive Models for the Survival of *Campylobacter jejuni* on Chicken as a Function of Temperature

a. Project Statement. This study was done to model the kinetics of *Campylobacter jejuni* survival on cooked chicken breast patties and in broth as a function of temperature. A three phase linear model fits the primary survival curves well at all incubation temperatures, regardless of model medium. Lag time and specific death rate were calculated from the primary survival model at each temperature. Secondary models that predicted lag time and specific death rate as a function of temperature were also developed. The Davey and Boltzmann models were identified as appropriate secondary models for lag time and specific death rate, respectively, based on goodness of fit (r^2) and prediction bias (Bf) and accuracy factor (Af) tests.

b. Impacts. This study helps to provide safe handling practice guideline for poultry products. The data collected in this study will be incorporated into the USDA, ARS Pathogen Modeling Program, where they can be used to predict the risk of *Campylobacter*.

c. Source of Funding: USDA/CSREES, Evans-Allen.

d. Scope of Impact: National and regional.

Project 2.2.2. Neighborhood GRIME Watch

a. Project Statement. Neighborhood GRIME Watch was developed by 4 county educators. It is an interactive tool for teaching proper hand washing. The team designed and constructed a 10'x10' black fabric lined tent, purchased a hand washing sink, black lights, and glo germ. Participants put glo germ on their hands, enter the tent, and view the "glowing pretend germs". They then proceed to the hand washing station where the instructors teach proper hand washing techniques. Participants then wash their hands and enter the tent again to see if their hands still glowed.

b. Impact. Project was presented at Maryland Day (University of Maryland Open House), Frederic County Fair, Montgomery County Fair, Carroll County Fair, Frederick County CE Open House, USDA Press Conference, Lions Club Kids Fest, Safeway Barbeque Bash and the Howard County Hospital. Approximately 8,000 people were reached in FY 06.

c. Source of Funding: Smith-Lever, grants, and state general funds.

d. Scope of Impact: Statewide.

Project 2.2.3. A County Example

a. Project Statement. Consumers are frequently ignorant of basic practices of food safety- the importance of storing and cooking food properly, using a food thermometer to monitor recommended cooking temperatures and the need to wash hands and utensils. Consequently improper food handling and preparation of food causes a significant number of cases of foodborne illness.

In collaboration with the Washington County Department of Social Services, Maryland Cooperative Extension- Washington County FCS Educator presented four (2 hour) food safety trainings and updates for Project Home/ C.A.R.E. licensed Assisted Living Providers as a certification requirement for licensing and renewal. These providers are working with the elderly, a high risk population, and the food safety trainings are an important part of their certification requirements.

The initial training was based on the *Feeding the Community Safely* curriculum

Subsequent food safety trainings and updates were developed by the Educator to identify and review proper food storage and preparation methods, and environmental issues related to food safety with the goal of increasing the frequency of safe food handling practices and sanitation.

b. Impacts. Survey data indicated (post program survey):

- 58% of certified Assisted Living Providers planned to improve health and safety within their home
- 50% planned to improve their food safety practices
- 82% felt better able to use food thermometers to monitor the temperatures of potentially hazardous food
- 75% plan to use a food thermometer regularly

c. Source of Funding: Smith-Lever, grants, and state general funds.

d. Scope of impact: County specific.

2.3. Improve the Knowledge and Practice of Safe Food Production and Handling by Commercial and Public Food Industry

(Key Themes – HACCP, Foodborne Illness, Safe Food)

Maryland Cooperative Extension educators developed dozens of educational programs, which were held in most counties, Baltimore City, three regions in Maryland, statewide, multi-state, and national. Topics covered were Hazard Analysis Critical Control Points (HACCP), Good Manufacturing Practices (GMP), and Sanitation Standard Operating Procedures (SSOP).

Examples of educational programs include the following:

Project 2.3.1. On-Farm Food Processing Course

a. Project Statement. MCE worked as a member of multi-agency (MD Dept. of Health & Mental Hygiene, MD Dept. of Agriculture, USDA, MCE) team that planned, developed, implemented, and evaluated a series of four licensing courses to familiarize farmers with revised on-farm processing regulations and expanded marketing opportunities (COMAR 10.15.04.19). The workshops were targeted to farmers who prepare value-added foods at home and market the foods through various outlets. The course was comprehensive and covered such topics as licensing requirements, food hazards and risks, food characteristics, processing for quality, good manufacturing

practices, and MCE developed an original 54 slide PowerPoint presented at all four workshop. A total of approximately 200 farmers participated in the course. The overall evaluation for the course was 4.4 based on a scale of 1 (lowest rating) to 5 (highest rating)

b. Impacts.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: State-wide.

Project 2.3.2. Seafood Safety for Industry

a. Project Statement. The U.S. Food and Drug Administration indicated that the control of histamine in susceptible fish species was the agency's number one Hazard Analysis Critical Control Point (HACCP) compliance problem, and that the seafood industry should expect increased regulatory scrutiny.

b. Impacts. A team was organized from both coasts and received funding from the National Sea Grant Office to develop a national training program. Nine universities participated in 2003, and made significant progress toward meeting the stated objectives. Drafts were prepared for a brochure, static display, resource list, three model histamine control/monitoring plans for commercial fishermen, video script and website plan. Seafood organizations and regulators are providing input into all phases of the project.

Progress continued on a related grant (USDA, Virginia Tech, lead institution) to identify the effect of commercial fish harvesting and handling procedures on the formation of histamine. Maryland commercial fishermen and a fish processor participated in the study. Fish temperature histories were recorded, histamine-forming bacterial species were isolated from fish and fish-contact surfaces, and histamine levels were quantified in fish tissue. A third grant (USDA) was finalized to investigate the effects of high hydrostatic pressure on inactivation of either the microorganisms or enzymes responsible for histamine formation.

Previous changes in HACCP guidance issued by the U.S. Food and Drug Administration were at least partially responsible for seafood industry confusion, non-compliance reports and even the regulatory detention of products. In response, a model HACCP plan previously prepared by the Seafood Specialist was revised and supplemented with sample record-keeping forms for posting on the Seafood HACCP Alliance website (U.C. Davis) and for use in Alliance Train-the-Trainer programs. In 2003 these guides were further refined and expanded to include model Sanitation Standard Operating Procedures and corresponding forms for complying with federal and state record-keeping requirements. Similar materials have been downloaded widely for international use.

c. Source of Funding: Smith-Lever 3b&c, 1890 Extension state general funds and Sea Grant.

d. Scope of Impact: Multi-state.

Examples of research projects include the following:

Project 2.3.3. Real-time Response Biosensor for *E. coli*

a. Project Statement. The goal of this study is to enable quantitative whole-cell biosensing by developing a novel dynamic system for the immobilization of stress-responsive luminous bacteria. To date, many genetically engineered strains containing selected stress-responsive *E. coli* promoters fused to the *Photobacterium luminescens* luxCDABE reporter have been developed. Use of the five-gene lux reporter system allows facile monitoring of gene expression because all components necessary for light production are present in the cell. The bioluminescence reporter has advantageous properties such as real-time response, excellent sensitivity, and large dynamic range because the product of its pathway, light production, can be easily detected. Moreover, not only do the responses of an organism to environmental insult supply instantaneous light signals, they also provide insight into the molecular mechanisms of toxicity because these responses also include repair mechanisms specific for the damage occurred.

b. Impacts. This research will focus on establishing a dynamic mechanism for the immobilization of bioluminescent *E. coli* that might lead to the development of quantitative whole-cell biosensors capable of monitoring food safety. The significance of the project is two-fold. First, of the various reporter systems available, bacterial bioluminescence has the unique advantage that gene expression can be monitored in real time without cell lysis. The stress-responsive luminous bacteria are capable of fingerprinting the specific stresses by responding with an SOS (real time) light signal. Second, the integrated cell immobilization mechanism enables rapid assembly of a biosensor for quantitative analysis of the light signals, which would have been greatly hindered in a suspension cell system. Should the signal reproducibility and stability be confirmed, it is expected that the results of the proposed research could establish procedures for rapid incorporation of similarly constructed biosensing strains.

c. Source of Funding: JIFSAN Competitive Grant.

d. Scope of Impact: International.

Project 2.3.4. Surveillance Program to Monitor Antimicrobial Resistance in Foodborne Pathogens.

a. Project Statement. *Campylobacter* is a common cause of bacterial foodborne illness worldwide. The pathogen is frequently present in animal products, particularly in poultry. During the last decade, many bacteria that cause human diseases, including *Campylobacter*, have developed resistance to antimicrobials commonly used for treatment. There is currently a great deal of speculation regarding the role that therapeutic and sub-therapeutic use of antimicrobial in animals has played in accelerating the development and dissemination of antimicrobial resistant bacteria. Since the discovery of the growth-promoting and disease-fighting capabilities of antimicrobials, farmers, fish-farmers and livestock producers have used antimicrobials

in everything from apples to aquaculture. With livestock production increasing in developing countries, reliance on antimicrobials is likewise expanding - often without guidelines in those nations where antimicrobials are sold without prescription. With the trends toward globalization and the relaxing of trade barriers, inadequate standards and enforcement in one nation means all others are vulnerable. Research is urgently needed to determine the potential role of antimicrobials used in animal production environments on emergence and spread of bacteria antimicrobial resistance in both veterinary and human medicine. In this study, we have provided Chinese colleagues technical assistance in determining the prevalence of antibiotic resistant *Campylobacter* in food in order to develop a national surveillance program on antimicrobial resistant foodborne pathogens similar to the US National Antimicrobial Resistance Monitoring System (NARMS). We have been working with colleagues at the Chinese National Institute of Food Safety Inspection and Nutrition. The Institute now has mastered techniques necessary to work on this unique organism and established its own national surveillance program. Research data have been presented at several Chinese national and international conferences.

b. Impacts. Microbial food safety is an increasing public health concern in the United States. The U.S. Centers for Disease Control & Prevention estimated that each year in the United States there are approximately 76 M foodborne illnesses. While most of them go undiagnosed, and thus, unreported, approximately 325,000 cases result in hospitalizations, and 5,000 cases are fatal. Anti-microbials are frequently prescribed empirically for treating diarrheal illness, including campylobacteriosis. Some studies have showed that increase in bacterial antimicrobial resistance is associated with antimicrobial use in food animal production. Food products in the U.S. have been imported from many different countries. Given the global nature of antimicrobial resistance, it is especially important to conduct studies on antimicrobial resistance of bacterial pathogens in developing countries, where inappropriate antimicrobial usage may be more common. The findings of this study will provide useful information to better understand antimicrobial-resistant bacteria in food imported from developing countries.

c. Source of Funding: USDA/ Scientific Cooperation Research Program.

d. Scope of Impact: International

Project 2.3.5. Spatial control of biological agents

a. Project Statement. Excess plant nutrients, pesticides, bacteria, viruses, pollen from genetically modified crops and invasive species (plant or animal) can significantly alter the integrity of agricultural production systems, soil, water and air, adjacent ecosystems, rural and neighboring communities. This project is aimed at the development of tools that aid in the prediction of biological agents movement patterns and in the design and engineering of effective preventative, remedial or containment strategies to prevent their spatial dissemination, off-site. The objective of this research project is to develop and analyze computational tools to aid in the prediction of biological agents movement patterns and the engineering of effective strategies to prevent their spatial dissemination.

b. Impacts. We developed new strategies for modeling nanoparticle-mediated remediation of bioenvironments, introduced fractional calculus into this model, continued the development of stochastic-wavelet spatial heterogeneity analysis, developed a Decision Support System (DSS) for Canada goose population control in the DC area and another DSS to analyze wetland function in extensive heterogeneous areas. This project will permit enhanced protection of the integrity of natural resources in a cost-effective manner. In the long run, it is also expected to help prevent the dissemination of such bioagents as avian flu virus or those emanating from bioterrorism.

c. Source of Funding: Hatch, MAES,

d. Scope of Impact: International

Project 2.3.6. Improvement Thermal and Alternative Processes for Foods

a. Project Statement. The U.S. consumer is constantly demanding safe, nutritious, and high quality sensory foods at low cost while seeking dietary changes exemplified by foods having low levels of salt, fat, and sugar. To address these trends, industry seeks to apply new technology with continued improvements in process efficiency and the manufacturing of value-added foods. The development of such processes requires new knowledge of food properties, the response of the quality attributes in foods to thermal and alternative processes, and models defining heat, mass, and momentum transfer. The expertise to develop this knowledge is often based in a number of different research institutions and disciplines. For many property and process development efforts, the probability of success is greatly enhanced by the collaborative sharing of expertise among member engineers, food scientists, biochemists, microbiologists and other scientists in Multistate Project NC-136.

b. Impacts. In the present study, the feasibility of using Chinese wolfberry (LYCH) leaves to promote the growth of *P. acidilactici* and the variations among different leaf preparation methods with respect to chemical constituents and growth-promoting effects were addressed. From a processing standpoint, if a simple operation could be established to release ingredients that stimulate the growth of probiotic cells, it would most likely be readily convertible for industrial applications and the process could be easily optimized to enhance cost effectiveness. In respect of biomass utilization and efficacy, it is highly desirable if the LYCH leaves were able to provide dual functionalities; both as a growth promoter for probiotics in feed and as a feed themselves to enhance the amino acids content and to improve the flavor, texture, and taste of the end products.

c. Source of Funding: Hatch, MAES, Multistate NC-136

d. Scope of Impact: National, International

Project 2.3.7. UMES- Characterization of Antibiotic-Resistant *Salmonella* spp. Isolated

from processed Poultry

a. Project Statement: *Salmonella* spp. are recognized as major food-borne pathogens in the United States, causing an estimated 1.4 M cases of salmonellosis and over 500 deaths annually. Food of animal origin, especially poultry and poultry products, has been implicated in outbreak of human salmonellosis. Antibiotic resistance increases the mortality rates due to foodborne illness and has been linked to overuse or misuse of antibiotics not only in human medicine but also of veterinary medicine and agriculture. The overall objective of this project is to characterize the antibiotic-resistant *Salmonella* spp. isolated from chicken presented for processing at a poultry plant. To accomplish this objective a total of 480 whole broiler carcasses were collected at two selected points on the processing line, pre-chill and post-chill and 24 water samples at the entrance and exit of the chiller from July 2004 to June 2005. Temperature, pH, free chlorine, and total chlorine in water at the entrance and exit of the chiller were measured every month. Carcasses were pre-enriched overnight by the whole carcass enrichment method. Pre-enriched samples were screened for *Salmonella* spp. using the BAX-PCR system. Samples positive for *Salmonella* by the BAX-PCR system were confirmed by culture method and serology. Water samples were enriched overnight and analyzed by the above mentioned method.

Eighty eight percent (88.3%) of pre-chill and 84.1% of post-chill carcass samples were positive for *Salmonella* spp. All water samples collected at the entrance of the chiller were positive for *Salmonella* spp. except for the month of October. In contrast, no water sample was positive for *Salmonella* spp. at the exit of the chiller. In this study, there was no significant differences between the incidence of *Salmonella* spp. on pre- and post-chill carcasses ($P>0.05$). Over the period of this study, there was no seasonal effect in the incidence of *Salmonella* spp. on broiler carcasses. There was no correlation between the presence of *Salmonella* on post-chill carcasses and the levels of free and total chlorine in the chiller water. The results of this study indicated that the chilling process did not have a significant effect on the incidence of *Salmonella* spp.

One isolate from each *Salmonella* positive sample (A total of 425 *Salmonella* spp.) was selected for serotyping and antimicrobial resistance. ~~More than~~ Ninety six percent (96.4 %) of *Salmonella* spp. were typeable and thirteen different serotypes were recovered from pre-chill, post-chill, and water samples. The most prevalent serotypes were *Salmonella* Kentucky (59.5%) and *S. Typhimurium* (17.8%).

All 425 *Salmonella* isolates were tested for antimicrobial resistance to 15 different antimicrobials commonly associated with animal health over a wide range of concentration. A total of 79.7% of isolates (339 of 425) were resistant to one or more antimicrobial agents tested. In general, most of the *Salmonella* isolates (45.8%) were resistant to an average of five or more antimicrobials. Resistance to tetracycline was the most common and observed in 312 (73.4%) of the isolates.

Serotypes Kentucky and Typhimurium isolates resistant to sulfisoxazole and ceftiofur were tested for class 1 integrons and *bla*_{CMY} genes. Sixty seven percent of the Kentucky possessed gene for *bla*_{CMY}, 1 kb in size. In contrast, none of the isolates belonging to Kentucky possessed gene class 1 integrons. However, 30% of serotype Typhimurium

possessed the class 1 integrons (1 kb). The *bla_{CMY}* gene was not detected in serotype Typhimurium.

Pulsed-field gel electrophoresis will be used to assess the genetic relatedness among the *Salmonella* spp. isolated from processed chicken. In addition, predictive models for growth of *Salmonella* on processed chicken as a function of strain variation will be developed depending on project outcomes and feasibility.

One M.S. student graduated with experience in Microbiology and Molecular Biology in fall, 2005. One Ph.D. student has been trained in Molecular Biology to conduct research on molecular characterization of *Salmonella* spp. in partial fulfillment of the requirements for the degree of Doctor of Philosophy. In addition, collaborative research has increased among UMES, USDA, and FDA.

b. Impacts: The results of this study indicate that a large number of *Salmonella* spp. isolated from processed poultry were resistant to antibiotics that are commonly used in human and animal therapy, as well as animal feed. This research also suggests that class 1 integrons and *bla_{CMY}* genes contribute to antimicrobial resistance among *Salmonella* spp. Moreover, the results of this study provided valuable information about the incidence of antibiotic-resistant *Salmonella* spp. and variation in their antibiotic resistance profiles isolated from pre- and post-chill processed chicken.

Molecular characterization will give useful information on clonal diversity among pre- and post-chill isolates, and more scientific base for tracking sources of contamination in poultry processing plants. The predictive microbial growth models for *Salmonella* spp. to be developed in this study will help HACCP analysis and input information needed for microbial risk assessment to multiple interest groups such as USDA, poultry industries, retailers and consumers. Therefore, the investigators anticipate that the results of this project will assist the chicken producers and integrators in tracking *Salmonella* transmission pathways and in planning antibiotic use strategies to prevent economic loss and to increase the safety of our food supply.

Graduation of one M.S. student with experience in Microbiology and Molecular Biology, training of one Ph.D. student in Molecular Biology as well as establishment of collaborative research among UMES, USDA and FDA will enhance the national and international standing of UMES research programs, thereby enhancing student recruiting and the recognition of its microbiological research and outreach programs.

c. Source of Funding: USDA/CSREES and Evans-Allen.

d. Scope of Impact: National and Regional.

Project 2.3.8. UMES - Education Program for Improving Food Safety on the Delmarva Peninsula

a. Project Statement. The Delaware, Maryland and Virginia (Delmarva) Peninsula has a rich and storied agricultural heritage with chicken, seafood and fresh produce being

mainstays of the economy, along with tourism. The University of Maryland Eastern Shore (UMES) has played a key role in sustaining the local agricultural economy through its research, teaching and extension/outreach programs. The opening of a new Center for Food Science and Technology in 2003 enhances the ability to deliver learning opportunities for students, as well as the local community. The overall objective of this project is to expand food safety education on Delmarva by:

- Developing and teaching a graduate level course focused on HACCP.
- Developing and teaching short courses in Food Safety/HACCP for local food producers and food handlers.
- Supporting an industry-regulator HACCP roundtable for discussion of current issues and practices in HACCP implementation.
- Increasing the institutional capacity of UMES for extension/outreach.

b. Impacts. This project is creating a cadre of food safety professionals capable of teaching Food Safety/HACCP courses, auditing food safety systems and implementing practices that enhance the safety and wholesomeness of foods. During the reporting period, a 60% increase in student enrollment has been achieved. A closer interaction with the regional food processing industry has been established and one student performed an internship at a local poultry processor. The HACCP roundtable discussions continue to help in the clarification of new and changing regulatory requirements so that the poultry processing companies in our region (5 companies, 11 plants) can be more effective in implementing changes to comply with those requirements. A link was established to a webcast of a FSIS workshop on food security and made available to the poultry industry. Seven representatives participated. Interest in and visibility of our Food Science and Technology Ph.D. program increased.

c. Source of Funding: CSREES- Capacity Building.

d. Scope of Impact: Regional and National.

Project 2.3.9. UMES - Safe and Sustainable Production of Sheep and Goat Meat

a. Project Statement. The USDA Economic Research service estimated a cost to the U.S. of up to \$37.1 billion dollars annually due to illnesses from just the top seven food borne pathogens, and antibiotic resistance in food borne pathogens (linked to antibiotic use in livestock) exacerbates the problem. This research project includes techniques in biotechnology, microbiology, immunology and agricultural sciences that will be combined to create a balanced system for the research of food safety and sustainable production methods. The overall objectives are

- Determine the E. coli O157:H7 contamination in goats and sheep at UMES and the level of antibiotic resistance if present.
- Determine effectiveness of probiotics in goats and sheep as a potential alternative to antibiotics in livestock feeds.

b. Impacts. Preliminary studies involving UMES goats and sheep have indicated that the food-borne pathogen *E. coli* O157:H7 has not been found in this flock. Two goat studies involving the use of probiotics (direct fed microbials; naturally-occurring beneficial organisms) instead of antibiotics in feedlot diets have been conducted. The use of probiotics in the first line of defense against livestock illness has been discussed at producer meetings and workshops. Applied results of three different probiotics studies in goats have been published in the Maryland Sheep and Goat Newsletter (over 300 viewers). A preliminary study in sheep involving probiotics has also been conducted. Various meetings and workshops with over 200 attendees have introduced probiotics to producers and 4-H youth involved in raising goats and sheep. Over 300 producers viewing the Maryland Sheep and Goat Newsletter have been exposed to probiotic use through research reports. Therapeutic antibiotic use at the UMES farm has decreased by half with probiotic use. In addition, four producers now successfully use probiotics (all natural) when their animals first get stomach problems and do not use antibiotics unless the sickness continues for more than 2 days. Therefore, antibiotic use in goats and sheep on 4 other farms has also decreased (on one farm by more than half). Two students have been taught modern biotechnological and microbiological techniques and are training others, including a new laboratory technician, to use the techniques, increasing the research and teaching capacity at UMES.

c. Source of Funding. USDA-CSREES Evans-Allen and 1890 Extension.

d. Scope of Impact. State, Regional, National and International.

Part A. Planned Programs (continued)

REE Goal 3. A Healthy, Well-Nourished Population

Overview.

Consumers need to choose healthier food behaviors because heart disease, cancer, excess weight and obesity, and osteoporosis lead to increased morbidity, lower quality of life, and, ultimately, premature death. People need to understand food composition and preparation techniques to select and prepare nutritious foods. Otherwise, they may avoid nutritious foods and use more expensive and less nutritious foods or mistake the description "low fat" for "low calorie." Consumers need integrated food and nutrition education programming, which must address the interaction of nutrition, diet, fitness lifestyle issues, and physical fitness, in order to be successful in reducing chronic disease risk, excess weight and obesity.

As a result of MCE programs, it was expected that an increased number of consumers would:

- Follow the recommendations of the U.S. Dietary Guidelines and the new Food Guide Pyramid.
- Correctly use food labels to follow the U.S. Dietary Guidelines and the Food Guide Pyramid.
- Access Extension and other science based information on diet, nutrition, and healthy lifestyles.
- Reduce their incidence of diet-related health problems by evaluating their eating patterns and lifestyle practices relative to cardiovascular disease, cancer, diabetes, obesity, and osteoporosis risk and identifying low-risk dietary and lifestyle factors to minimize cardiovascular disease, cancer, diabetes, obesity, and osteoporosis incidence.
- Limit their fat intake to 30 percent or less of energy intake.
- Increase their consumption of calcium-rich food sources.
- Increase physical activity and physical fitness and achieve or maintain a healthier weight.

Outcomes and impacts were measured in individual programs. Examples of these are in the following section.

Partners in these programs included county health departments, the Maryland Department of Health and Mental Hygiene, county social services departments, the Maryland Department of Human Resources, the Eastern Shore Health Education Center, most school systems, the UM Department of Health and Human Performance, FSNEP and EFNEP programs. Cooperation with other members of the land grant system included VA, West VA, DE, NJ, and PA.

Maryland's own assessment of accomplishments. Maryland Cooperative Extension is accomplishing the goals of their five-year plan. There is a balance of educational programs among the various goals and the Extension Administration Team is pleased with the accomplishments. Evaluations of outcomes from the five-year plan are conducted at the individual program level, not at the level of an aggregated REE goal.

3.1. Improve Maryland Citizens' Knowledge and Practice of Healthy Diet and Nutrition Behaviors

(Key Themes – Human Nutrition, Human Health)

Outputs. For REE Goal 3, Maryland Cooperative Extension educators developed and delivered over 2,200 educational programs resulting in 7,440 presentations to over 84,000 participants, which were held in all 23 counties, Baltimore City, state-wide, multi-state, and national. Topics covered were U S Dietary Guidelines, Food Guide Pyramid, consumption of five fruits and vegetables per day, use of food labels, lifestyle practices relative to disease and physical fitness.

Examples of educational programs include the following:

Project 3.1.1. Nutrition and Wellness Education Designed to Improve Quality of Life Among Residents – A County Example

a. Project Statement. In this county, since 2000, the extension educators have designed and taught over 125 educational classes for 3,000 individuals. In 2006 alone, 200 clientele were reached via classes focused on weight management, physical activity, fad diets, and dietary supplements. The training incorporated a variety of innovative teaching techniques including interactive activities and motivators such as pedometers. The target audience for the programs included clientele at senior centers, adult day care centers, churches, civic clubs, schools, and clientele at state and county agencies.

b. Impacts. In 2006, post-then-pre data were collected from participants who attended healthy living classes for weight loss. The data revealed that participants significantly increased their understanding of meal planning for weight loss since no participants had a “complete” understanding prior to the class versus 75% following the class. In addition, only 8% of participants had a “complete” understanding of label reading prior to the class in comparison to 83% following the class.

In terms of intended behavior changes, three-fourths of the participants planned to follow a healthier diet after improving their knowledge of the appropriate strategies. Specifically, 62% reported that they would select smaller portion sizes to limit calories for the purpose of losing weight with nearly one-half of participants claiming to increase physical activity.

In addition to the data from weight management classes, the educator gathered information from participant at sessions focused on vitamins, minerals, and herbal supplements. With regard to knowledge changes, there was a significant increase in knowledge related to the recommended intakes and limits of specific vitamins and minerals. Also, data indicated that participants improved their understanding of the side effects of herbal supplements as well as the potential medication interactions.

Evidence of the overall positive impact of the dietary supplement classes was demonstrated by 73% of the participants reporting greater confidence in making informed decisions about supplements. Following the class, each participant committed to making specific behavioral changes with regard to vitamin and mineral consumption. Examples of these included “increasing calcium consumption through foods”, “decreasing the amount of fat-soluble vitamins”, and “checking for medication-supplement interactions.”

Long-term impact was measured through telephone surveys six months following the classes. Results indicated that 73% of participants continued to use the recommended healthy strategies. In terms of health improvements reported to them by their physicians, 44% saw weight decreases, 35% reported blood cholesterol improvements, and 11% experienced better blood glucose and A1c levels.

c. Source of Funding: · Smith-Lever 3(b) & (c), and state general funds.

d. Scope of Impact: County Specific.

Project 3.1.2. Diabetes nutrition education in rural Western Maryland

a. Project Statement. With rates of chronic disease in both Garrett and Allegany Counties higher than the state average, the need for nutrition education is well-established. Maryland has the fourth highest mortality rate for diabetes in the country with Allegany County having the sixth highest rate in the state. Combating this epidemic through education is essential since annual medical costs for people with diabetes averages \$13,243 versus \$2,560 for people without diabetes

Programming resulted in :

- Nutrition education, focused on in-depth diabetes meal planning, targeted clients with or at risk for diabetes in Garrett and Allegany Counties. To encourage behavior changes, the program was implemented as a six-hour series taught over a three-month time period.
- 327 individuals improved their knowledge and changed their lifestyles as a result of series
- Due to the uniqueness and reputation of the program, health professionals throughout the community, including physicians, highly encouraged their clients to attend the sessions.

b. Impacts. Pre-tests were administered at the beginning of the first class and post-tests immediately following the completion of the third class of the series. Evidence of knowledge changes existed in that only 10% of participants had a good understand of meal planning prior to the series, in comparison with 95% following the series. In addition to knowledge changes, each participant made commitments to make specific behavioral changes at the final class of the series. Over 95% committed to choosing healthier foods. In addition, 80% reported that they planned to select appropriate portion sizes and 74% made a commitment to increase daily physical activity. Qualitative data also revealed important outcomes of the program.

Participants were surveyed three months following the classes to determine long-term behavior changes. Over 70% were continuing to select and combine foods with appropriate carbohydrate content for their specific meal plans.

Six months following the series, one participant reported that she had been managing her diabetes strictly through diet which resulted in “my weight decreasing by 25 pounds, my fasting glucose declining from 292 to 130 mg/dl, and my A1C decreasing from 11.2% to 7.1%.” This is significant, since for every A1C percentage point

decrease; there is a 35% reduction in the risk of developing diabetes complications such as kidney disease, nerve damage, and blindness. Additionally, every percentage point decrease in A1C is associated with a 25% reduction in diabetes-related mortality and an 18% decrease in heart attacks.

As evidenced above, these educational efforts have resulted in behavioral changes that lead to fewer long-term complications resulting in significant savings in healthcare dollars. For example, people with diabetes who control their disease by keeping their blood glucose down cost employers only \$24 a month, compared with the \$115 a month for people with diabetes who do not control their blood glucose. So, if the 327 class participants improved their diabetes management, there would be a saving of over \$350,000 within Western Maryland.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: Multi-county, and several states have requested materials.

Project 3.1.3. Healthy Lifestyles for Youth – A County Example

a. Project Statement. One of the four H's – Health – falls under the 4-H human science curriculum area.

Obesity in children is increasing at an alarming rate, particularly in minority populations. Poor eating habits and physical activity patterns are often established during childhood and the U.S. has experienced alarming increases in obesity among children and adolescents.

Overweight prevalence has increased to 25% for children. Overweight and obesity statistic for Maryland mirror the national averages. Recent studies sponsored by the National Heart, Lung and Blood Institute have shown that nutrition education programs can teach children to eat healthier foods, particularly when parents are also receiving nutrition education (Pediatrics, June 2005.)

This educator developed programs and classes, managed camps, workshops, activities, media events, in-school educational programs and summer enrichment programs and secured grants and contributions to reinforce the importance of a healthy diet and increased physical activity to overall health.

Between 2000-2006 there were 610 healthy-lifestyles related classes taught by this educator, volunteers or a faculty extension assistant supervised by this educator. The goal is to increase youth knowledge about healthy food choices; demonstrate youth ability and skills in making healthy food choices; try new and unfamiliar foods; increase youth fruit and vegetable consumption, and to help youth develop self-confidence and be successful at solving problems and meeting challenges.

b. Impacts. A direct result of these healthy lifestyle programs has been an increase in demand for the classes by various sectors in the community. For the FSNE program, parent and teacher surveys indicate greater participant awareness about healthy food choices, and have resulted in youth requesting foods lower in saturated fat and sugar at

home. Over a three-year period, parent surveys have showed 75-93% reporting that their child had found a new food he/she liked since the beginning of the school year and were consuming more fruits and vegetables as a result of the program. Because of this educator's expertise in exercise and fitness, she was given a special assignment during 2005-2006 to work with postmenopausal women to develop a strength training program to improve balance, fragility and muscle and bone strength.

c. Source of Funding: Smith-Lever 3b&c: EFNEP and FSNEP funds; and state general funds.

d. Scope of Impact: State-wide and multi-state.

Project 3.1.4. Childhood Obesity Prevention.

a. Project Statement. Childhood obesity has become an epidemic in Maryland and across the country. The incidence of Type II diabetes among children is growing at an alarming rate. Maryland has the 8th highest rate of diabetes in the nation. This costs the state \$2.5B annually and the country \$117B. This educator has taught the Latino Diabetes program for 6 years. We have encouraged entire families to attend. We observed that most of the children were overweight and at high risk of developing diabetes and other medical problems. In 2003, this educator approached 4-H educators in Montgomery County to assist in the development and implementation of a pilot youth program that would be implemented in conjunction with our adult program. This program was implemented in FY04 and has continued to the present.

A diabetes education and cooking school was developed to provide information and practical instruction to diabetics in the Latino community. Diabetic patients at the Spanish Catholic Center had no health insurance and therefore no access to health education. A series of 3 classes were planned and executed. Twelve classes (4 series) were conducted again in 2006.

b. Impacts. The program that runs in conjunction with the adult Diabetes classes was conducted in FY06 for African American and Latino children.

Class observations showed increased knowledge of the food guide pyramid, serving sizes, and ability to jump rope. Children demonstrated ability to prepare healthy snacks and lunches.

Two interactive nutrition and physical activity workshops were held for 25 Latino children.

c. Source of Funding: Smith-Lever 3 b& c and state general funds.

d. Scope of Impact: Multi-county.

Project 3.1.5. Nutrition, Health and Fitness for Youth – A County Example

a. Project statement. According to the Prince George's County Health Department, 35% of elementary school aged youth are either over weight or obese. The Prince

George's County Public School District is the 19th largest district in the United States, with 196 schools enrolling 135,039 students. Calcium-rich kale and sweet potatoes are two of the regular low-fat veggie side dishes available at county elementary schools. Seasonal fresh fruit and hot or cold vegetarian main dishes, such as cold salad platters, are available daily. Adding such daily vegan entrees as veggie hot dogs, veggie chili, and bean and brown rice burritos to the menu, as well as offering calcium-fortified juices, would increase Prince George's County's grade from a C+ to an A+.

Goal and/ or Objective: To increase youth awareness on the importance of eating a variety of fruit and vegetables, role that physical fitness plays in being healthy and food safety.

Targeted Audience: Elementary aged youth (ages 6-12).

b. Impacts. During the summer of 2006, a four week Nutrition program was conducted, as has happened for the past 10 years. A total of eighteen sites in both the Southern and Northern Regions of Maryland – National Capital Parks and Planning Commission were slated to receive 4-H SEP Nutrition Educational Programs. Educator assisted EFNEP Coordinator in justifying a need to hire additions summer support staff to deliver program and contracted site with M-NCPPC. Educator provided format in program delivery process as well as had input into curriculum development. Educator pre-visited all thirty six sites and trained over 150 M-NCPPC adults and teen staff prior to Extension Nutrition Assistants conducting introductory lesson. Over 2000 youth (48% female and 52% male) ages 5-12 from the thirty-six sites increase their knowledge on the importance of a Healthy Breakfast, Keeping It Clean, Scrumptious Snacks, Fruits and Vegetables in our daily diet and Let's Get Physical (the role of exercise in our daily lives). Both pre-post tests were conducted.

c.

Data revealed that:

- 88% of participants now eat a variety of food
- 88% of participants now eat a variety of fruits and vegetables and at least five servings daily
- 87% of participants increased their knowledge on the essential of human nutrition
- 91% of participants increased their ability to select low-cost nutritious foods
- 91% of participants improved practices in food preparation and safety.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: Multi-County and State-wide.

Project 3.1.6. Wellness Works

a. Project Statement. In partnership with the Cancer and Cardiovascular Disease Prevention Program of the St. Mary's County Health Department, this educator co-developed and co-presented two 10-week Worksite Wellness programs for county government employees. The goals of the program were: to make employees aware of their health risks for developing chronic disease and to facilitate employee efforts to

change behaviors to reduce health risks through assessment, goal setting, nutrition and health education and motivational tactics. Specifically, this educator taught group classes on how to make journal entries, set realistic weight loss goals, use the Dietary Guidelines for Americans, read and use food labels and construct healthy meals.

d. Impacts. Pre-and post-assessments, including blood tests, body fat analysis, blood pressure readings and self-reported health behaviors, demonstrate the following program impacts on health parameters of participants:

Of the 22 out of 28 (79%) participants that completed the program:

- 10(45%) improved blood pressure (systolic decreased an average of 11mmHg; diastolic decreased an average of 6mmHG)
- 6(27%) reduced LDL cholesterol (average decrease was 20mg/dl)
- 10(45%) lowered triglycerides (average decrease was 52 mg/dl)
- 11 (50%) lost an average of 2 lbs.
- 9(41%) reduced body fat (average 0.5% decrease in body fat)
- average daily pedometer steps per person was 5,197

100% of the 22 participants who completed the program also completed both a pre- and post-survey:

- 14(64%) reported increased fruit and vegetable intake
- 11(50%) reported an increase in physical activity
- 18(82%) reported they are making better nutrition choices, such as using less fat, cholesterol and salt.

c. Source of Funding: Smith-Lever 3 b& c, grant funds and state general funds.

d. Scope of Impact: Numerous counties.

Part A. Planned Programs (continued)

REE Goal 4. Achieve Greater Harmony (Balance) Between Agriculture and the Environment

Overview

Maryland has abundant water resources. Surface water provides more than 80 percent of the state's water supply; however, ground water supplies approximately 85 percent of the total water used in Southern Maryland and the Eastern Shore. Studies have shown that both ground and surface waters contain high levels of the nutrients nitrogen and phosphorus (N and P), which adversely affect water quality, aquatic organisms, fisheries, and human health.

Under the Chesapeake Bay agreement, there is to be a 40 percent reduction in nutrient loading into the Bay by the year 2020. In agriculture areas, there are concerns about the management of inorganic and organic sources of nutrients and chemicals. In urban areas, nutrients and pesticides enter Maryland's water supply through excessive use of pesticides and fertilizers in horticultural landscape applications (commercial, public, and private). According to the 1990 census, one in five residences in Maryland have private septic systems bringing the state's total to 316,000. It is estimated that 60 percent of these systems are failing and that they contribute substantial amounts of nitrate to ground water. Other water-related issues include salt-water intrusion in coastal areas caused by high water demand and competition for finite supplies of water among residential, agricultural, and industrial uses.

Economic and demographic changes have led to a continuing loss of agricultural and forestland. These losses raise concerns about the continuing viability of agricultural and forest industries, green ways, open space for wildlife, recreational areas, amenities, and environmental quality in general. And the losses are likely to continue to the year 2020 at a rate of over 10,000 acres per year.

Maryland's population is expected to reach over 8 million by the year 2010. This population growth and redistribution, as well as commercial and industrial development will consume farm, horticultural, and forestland. At the same time, this growing population will also demand more services and products from agricultural, horticultural, and forest industries. Conflicts between agricultural and urban land uses and their impacts on natural resources occur as development takes place in once-rural areas. As development occurs, farm and forestland is fragmented and/or lost, reducing the open space and biological diversity of the area. This forest and habitat fragmentation reduces our ability to manage and maintain the resources of a healthy state. Currently, land-use planning and management issues are being addressed by a wide variety of public and private organizations, which often lack coordination and consistency among their programs and policies. Integrated resource management and landscape diversity are key components of land-use planning, but are often not considered.

The contamination of surface and subsurface water supplies due to non-point source agricultural runoff is among the most serious environmental problems facing American agriculture today. About 60% of the rivers and lakes in the United States are polluted by agricultural runoff; rivers primarily by sediments, and lakes by nutrients. Additionally, surface and groundwater are contaminated by a variety of pesticides, and nutrient sources such as fertilizers and manure. Non-point load of nutrients to surface waters in different regions of the U.S.A. is among the highest priorities in the country. One of the challenges for developing an economically sustainable

agricultural system is to simultaneously reduce non-point source pollution problems and maintain farm and rural industrial incomes at reasonable levels. One solution is watershed-scale planning and management which makes it possible to target Best Management Practices (BMPs) for the greatest improvement in water quality even though watershed planning is much more complicated than field or farm scale planning.

As an 1890 Land Grant institution, UMES is committed to continue the services and applied research we provide area farmers, watermen and resort residents (Eastern Shore tourism industry). We expect to bridge the agricultural, environment, and renewable natural resource programs and find ways that farmers and businessmen can be economically enhanced while not harming the environment and do so with concern and sensitivity.. Presently many of our scientists (and those at College Park) are seeking solutions to resolve a recent Delmarva disaster that placed farmers, watermen and environmentalists at odds, and resulted in what is believed by the poultry industry to be a rush to judgment by politicians. During the summer of 1997, Delmarva made national news because of fish kills and lesionous fish in the Pocomoke River. The river provides a habitat for numerous fish species and other aquatic organisms, and it serves as a source of revenue and recreation for the inhabitants of its watershed. *Pfiesteria piscidia* has been implicated as the cause of the lesions and subsequent death of hundreds of fish. Toxins produced by this microbe are also thought to be deleterious to human health. The primary goals are:

- Adopt management practices for agricultural production that enhance natural resources.
- Improve the application and adoption of land-applied biosolids, manures, composted materials, and other organic byproducts.
- Improve water quality through the adoption of sound environmental stewardship practices by the public and municipalities.
- Maintain a water supply capable of supporting both commercial and private needs today and in the future by protecting and conserving surface and ground water resources.
- Promote environmentally sound land use plans that manage growth and value the benefits to society of farms and forestlands.
- Increase recycling and appropriate product disposal.
- Promote the use of rural and urban forest stewardship practices to maintain a sustainable forest resource.
- Improve fish and wildlife habitat and species diversity, as well as promote the use of new management techniques that manage wildlife and control damage to property, crops and people.

Outputs

For REE Goal 4, Maryland Cooperative Extension educators developed 476 programs in 23 counties, Baltimore City, three regions of Maryland, state, multi-state, and national. Topics covered included water quality, water supply, recycling, forestry, nutrient management, IPM, and fish & wildlife. These programs reached 76,137 people. In addition, through the Home & Garden Information Center, 13,494 calls and over 700,000 Web-based sessions were received, where expertise and guidance was provided on plant diseases, insects and IPM strategies.

Outcomes and impacts were measured in individual programs. Examples of these are in the following section.

Maryland Cooperative Extension is accomplishing the goals of their five-year plan. There is a balance of educational programs among the various goals and the Extension Administration Team is pleased with the accomplishments. Evaluations of outcomes from the five-year plan are conducted at the individual program level, not at the level of an aggregated REE goal.

4.1. Improve the Application and Adoption of Land-Applied Biosolids, Manure, Composted Materials, and Other Organic Byproducts.

(Key Themes – Agricultural Waste Management, Nutrient Management, Soil Quality, Yard Waste/Composting)

Maryland Cooperative Extension educators developed 108 programs in 23 counties, three regions of Maryland, state, multi-state, and national. Topics covered included farmers increasing their use of nutrient management plans; farmers avoiding the over-application of phosphorus on soils already deemed to be overloaded; and the farmers and citizens properly applying composted materials, manure, and other organic products to the land. These programs reached 7,006 people.

Examples of educational programs include the following:

Project 4.1.1. Nutrient Management Program.

a. Project Statement. Maryland's *Nutrient Management Program* was developed by the MCE in cooperation with the Maryland Department of Agriculture. This program was a result of Maryland's 1998 Water Quality Improvement Act. This act requires farmers to have a "N" and "P" based nutrient management plan on their farm. MCE trains people how to write a nutrient management plan as well as training recently certified Nutrient Management Consultants on program and research updates on components of a nutrient management plan. The majority of recently certified consultants have little or no experience in nutrient management planning. This is the only program of its kind in the State of Maryland. Consultants are instructed in the entire nutrient management planning process. They are given instructions and written information on required plan content established by MDA: potential cost-share resources, data collection, soil and manure sampling and analyses, PSI, nutrient recommendations and the development of recommendations using computer software, plan delivery, and follow-up. Technical information material is provided for manure spreader calibration, the pre-sidedress soil nitrate test (PSNT), manure quantity generation, and record-keeping. Consultants are provided with information material that they can give to their clients to help them better understand nutrient management and the planning process. Sources of equipment and supplies that may be needed to develop plans are provided. Finally, consultants are introduced to *NuManMD* nutrient management software and guided through its functions by presentation of an instructional scenario.

b. Impacts. Work continued in enrolling new agricultural businesses in the Nutrient Management program during January 2006, through December 2006, with a 2006 total

number of 850 nutrient management plans written by MCE advisors on over 58,000 acres and 3,988 updated plans were written for 287,000 acres. All of the agricultural businesses were provided a written nutrient management plan with one-on-one technical service provided by MCE Nutrient Management Advisors.

Eighty clientele, representing agricultural business, nutrient management consultants & advisors, and government agencies, received six hours of classroom instruction in advanced Phosphorous nutrient management. In addition, 203 farmers, agricultural business consultants and government advisors were instructed in basic soil sciences, animal waste and sludge management, and the implications of the 1998 Maryland Water Quality Act. MCE state & regional specialists and county agents provided basic and advanced training programs.

County agents taught 40 nutrient management voucher programs to 620 farmers.

Pre-sidedress nitrate testing (PSNT) is an in-season soil nitrate evaluation performed on corn crops to determine if additional nitrogen applications are needed during the growing season. The PSNT consistently prevents over application of nitrogen to Maryland fields, helping to prevent eutrophication of waterways while conserving producers' financial resources. In 2006 Maryland Cooperative Extension nutrient management advisors performed the PSNT on over 14,500 acres for 116 producers. Because of participation in the PSNT program, the estimated reduction of nitrogen applied to Maryland cornfields amounted to over 334,000 pounds or 23 pounds per acre. In addition, Maryland Cooperative Extension advisors performed 118 yield checks and 33 manure spreader calibrations.

In 2003, MCE developed a "Pilot Program" to certify farmers to write their plans. Currently for farm operators to become certified to compile their own nutrient management plans, they must complete a challenging course designed to validate and certify consultants. Currently, many farmers are not able to obtain the services of MCE-NMP Advisors due to excessive workloads of those advisors. Farmers must themselves become certified or hire a private sector consultant in order to comply with Maryland's Nutrient Management regulations. Farmers who complete this program will have a certified nutrient management plan. Farmers who pass the certification exam (given as part of this program), and who complete their nutrient management plan, will be certified. Six initial programs and eight follow-up classes were held in 2006, in Carroll, Montgomery, Caroline, Calvert, Baltimore and Frederick Counties, with 55 farmers completing the training and certified to write their own plans. To date, 192 farmers have become certified under this program. This program will be repeated in 2007 in other areas of the state.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: Multi-County Specific.

Examples of research projects include the following:

Project 4.1.2. Low-Phytate Soybeans Increase Poultry Nutrition and Reduce Manure Phosphorus

a. Project Statement. Soybeans are one of the world's most important sources of vegetable protein for human and animal nutrition. Soy protein preparations also provide minerals, but phytic acid in soy protein has been shown to reduce the bioavailability of certain essential minerals, such as Zn. The phytic acid forms chelates with metal ions including Ca, Mg, Zn, and Fe preventing these compounds from being absorbed in the intestinal tract of humans and monogastric animals such as poultry and swine.

Phytate is the principal source of phosphorus in the seed. Phytic acid is the storage form of phosphorus and accounts for 60 to 80% of the total phosphorus in soybeans. The unavailable phosphorus present in phytate is replaced in animal rations by adding extra phosphorus to the soybean meal. The animal excretes the unavailable phosphorus in phytic acid and manure disposal creates environmental problems in areas with high soil phosphorus. Enzyme phytase has been added to soy meal to increase phosphorus and mineral availability in poultry rations. An alternative procedure is to reduce the phytate in the seed genetically. This approach has been used with corn and high available phosphorus (HAP) corn hybrids are now being evaluated in poultry feed formulations. This approach has stimulated much interest in the Delmarva region to help reduce poultry manure phosphorus. The development of low phytate soybeans would be a desirable complement to HAP corns in reducing manure phosphorus.

b. Impacts. Breeding populations developed from crossing the Purdue low phytic acid mutant with productive Maryland and other conventional cultivars and breeding lines have been developed. Selection of individual plants with low phytic acid was completed in 2002. A large number of breeding lines were developed and evaluated during the winter of 2002-03 to identify homogeneous lines for this trait. All lines were then be evaluated in tests grown across the state in 2003 to look for productive lines that have the potential for release as new cultivars. Tests will be undertaken to determine the feeding value of these modified soybeans in meeting the nutritional requirements of Maryland's poultry industry and their utility in reducing the phosphorus content in the manure. Other projects in 2004 include : determination of the best use of phytase in boiler diets so phosphorous is minimized and documentation of changes that have occurred in litter phosphorous content after implementation of phytase use in the field. Litter phosphorous content was found to have decreased an average of 30% after 2 years of phytase use in commercial flocks in Delmarva.

c. Source of Funding: United Soybean Board, Maryland Soybean Board and Maryland Agricultural Experiment Station.

d. Scope of Impact: National.

4.2. Improve Water Quality Through the Adoption of Sound Environmental Stewardship Practices by the Public and Municipalities.

(Key Themes – Biological Control, Integrated Pest Management, Pesticide Application, Riparian Management, Soil Erosion, Water Quality: Key Themes from Goal 1: Home Lawn and Gardening)

Maryland Cooperative Extension educators developed 227 programs in 23 counties, Baltimore City, three regions of Maryland, state, multi-state, and national. Topics covered included proper applications of nutrients and pesticides by homeowners; increase knowledge of septic systems; municipalities adopt environmentally sound practices of water and nutrient management; green industries practice bay-wise techniques; developers, loggers, and landowners reduce soil erosion; and increased installation of riparian buffers by landowners. These programs reached 22,768 people and had over 125,000 hits on its website www.MDIPM.umd.edu.

Examples of educational programs include the following:

Project 4.2.1. Private Well and Septic System Management.

a. Project Statement. The goal of this program is to educate homeowners on the importance of the maintenance of their private drinking water and onsite sewage systems. It is important for homeowners to understand how water moves through the earth and how a failing or neglected septic system or well could contaminate their drinking water and directly affect environmental and personal health.

Many Maryland residents lack education on their role in water quality degradation. Daily normal activities within homes and yards can contribute to water quality problems. This program has been designed to educate homeowners on how they directly affect water quality. Private septic systems are known polluters of the environment. Most homes with onsite wastewater treatment systems also have private wells for drinking water. It is imperative that both systems are maintained since they are in close proximity. According to the Maryland Department of Environment, more than 30,000 of the existing 427,000+ septic systems in the state are known to be failing, with estimates of 60% suspected to be failing! Yet, thousands more are being installed each year. Most of these failures are due to mismanagement and improper installation. In addition, urban residents are moving to more rural areas and are not familiar with the maintenance requirements of a septic system or well. Realtors and builders selling the homes do not provide information on these systems. Worse, the word-of-mouth information people pass along is usually incorrect.

b. Impact. Ten workshops were held educating 377 Homeowners, Master Gardeners, Agency Personnel, Service Organizations, and Environmental Groups. In addition, conducted approximately 50 phone and 243 email well/septic consultations in 2006. The majority of email consultations (78%) concerned septic systems and 19% concerned wells or water quality. 397 Master Gardeners received training credits, and 38 Baywise Master Gardeners received additional credit hours in 13 programs towards their Bay-Wise Certification. On average, 54 people visit the Septic Systems web site per day, with 5/day writing for specific help. Saved at least 60 people on average, \$11,400 (range \$500-\$40,000) each, by educating them on the need (or in most cases, lack of need) for expensive water treatment devices. Typically these people were told they needed a treatment device by a salesperson, when in fact they did not. At least another 60 (*known*) people saved on average \$300 each by learning of the unnecessary purchase of septic system additives. This doesn't account for the people who saved money by learning from the web sites and printed materials, or who did not directly inform the Specialist of their savings.

c. Source of Funding: Smith-Lever 3b& c and state general funds.

d. Scope of Impact: Multi-county and Statewide.

Project 4.2.2. Deep Row Biosolid Application to Grow Trees

a. Project Statement. Develop applied research and education program to encourage adoption of use of municipal biosolids in deep-row applications to grow hybrid poplar trees on gravel spoil sites.

b. Impacts. A partnership was developed with private firm (ERCO, Inc.,) in Prince George's County, WSSC, and MCE to secure grant funding and implemented extension education program for industry and agency personnel. Biosolids are applied in trenches on a gravel mine spoil, and then planting the site with hybrid poplar trees to utilize the nutrients in the biosolids over a 6-year rotation time. Educator has worked cooperatively with Gary Felton of UM Biological Engineering and Eric Flamino of ERCO, Inc. on a planned series of educational and research activities this year to secure funding and wider implementation. Agent has organized and led the following activities in the last year:

MCE has secured state recognition of tree operation as qualifying for woodland assessment for tax purposes by the DNR Forest Service. This will result in property tax reduction of \$21,000 per year for ERCO, Inc., and sets a precedent for other sites that may be established.

A field day was organized in October for 45 industry, university, and regulatory professionals (MDE, MDA, county agencies) that resulted in identification of additional research questions. As a result, a proposal was submitted by WSSC and other partners to answer the needed questions. A \$345,000 proposal was founded by the Washington suburban sanitary commission (WSSC) to address some of the environmental concerns. McIntire-Stennis funds of \$36,000/three years were secured this year.

c. Source of Funding: Smith-Lever 3b&c, McIntire-Stennis and state general funds

d. Scope of Impact: Multi-County Specific.

Project 4.2.3. MD Master Gardeners Program (Volunteers Help Home Gardeners Reduce Pesticide Use & Improve Water Quality)

a. Project Statement. Because of their desire for beautiful, pest-free landscapes, home gardeners often spray pesticides without first identifying a pest and sometimes apply pesticides even when the pest is no longer active or the plant injury is minor.

The Maryland Master Gardener Program was established in 1978 to teach citizens how to adopt sustainable gardening and lawn care practices and reduce unnecessary pesticide use through the Integrated Pest Management (IPM) approach. University- trained and certified Master Gardeners serve as volunteer horticulture educators, offering IPM education and diagnostic assistance via workshops, classes, plant clinics, information booths, and special programs, like the Baywise Gardening Project. They walk clients

through the IPM process-from correct diagnosis to monitoring, prevention and-when necessary-making targeted applications of least-toxic pesticides. They also teach home gardeners how to identify and attract beneficial insects.

b. Impacts. Created agendas and conducted four meetings (4 hours each) with the Master Gardener Advisory Board to address training, volunteer policy and management issues, and program goals. Communicated with MG coordinators and MG leaders on a regular basis. Two hundred forty eight individuals completed the Master Gardener training program in 2006 at 17 classes. Approximately 937 Master Gardeners reported 52,529 volunteer hours in 2006. The value of the 2006 volunteer service was estimated to be \$947,623 by the Governor's Office on Volunteerism and Service. Principal Master Gardener goals are to help achieve a reduction in unnecessary pesticide and fertilizer use by Maryland residents and to promote wise use of natural resources. (www.mastergardener.umd.edu). Organize and coordinate the all-day Advanced Training for Master Gardeners at College Park. Twenty seven learning sessions were taught by 28 invited presenters; 371 Master Gardeners paid to attend. Forty five MG trainees in Anne Arundel, Carroll and Prince Georges Counties took a pre- and post test developed by the state coordinator to evaluate knowledge gained in two key areas-integrated pest management and urban nutrient management. The average score rose from 47.3% to 97.2%. A new Master Gardener handbook was developed in 2006.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: Multi-County.

Project 4.2.4. Greenhouse Integrated Pest Management

a. Project Description. Nursery, greenhouse and landscape managers in Maryland's second largest agricultural industry (valued at \$1.24B in 2001) require cost-effective and environmentally safe materials and methods to control insects, and diseases and to efficiently use water and nutrients.

To help Maryland greenhouse managers stay on top of current insect, disease and fertility problems with greenhouse crops and to sustain and expand use of IPM techniques.

In a written survey conducted at MGGA educational event growers told us they need current information on what insect, disease and fertility problems were occurring in Maryland. They were also interested in using IPM methods that reduce plant losses. Toward this end we published a weekly 1- 2 page electronic e-mail list serve IPM report sent to all Maryland greenhouse and Extension offices in the state. Reports are then posted to IPMNET (CMREC web page). Obtained \$1000 funding from the Maryland Greenhouse Growers Association to support technician's time working on this project.

To help growers evaluate new low risk pesticides and investigate biological control in commercial greenhouses in Maryland.

Working closely with MGGA and Maryland Cut flower Growers Association we helped develop educational outreach programs to help the Maryland greenhouse industry

expand and improve in 2006. We offered 10 introductory classes to reach new greenhouse and cut flower growers in the State and introduce them to IPM methods as they develop their greenhouse operation plans. Involved Extension faculty in conducting these seminars to increase their contact with this agricultural community. Also published 4 articles per year in *MGGA HortFlash* on new low risk pesticides and biological control options. Working with national chemical companies to conduct trials to evaluate new low risk pesticide for efficacy. Results are published in refereed journals and trade journals to benefit growers.

Continued to publish a weekly 1- 2 page electronic Greenhouse IPM on current information on what insect, disease and fertility problems were occurring in Maryland. The report is sent to Maryland greenhouse growers and Extension specialists and educators. It advises them on how to use IPM methods that reduce plant losses. Reports are then posted to IPMNET (CMREC web page).

b. Impacts. Conducted lectures on Maryland IPM research at 2 international professional meetings one by Ball International Perennial Plant Conference held in Indiana. Professionals were trained in IPM methods with representatives from Mexico, Canada, Costa Rica, China, Germany, England and Japan. Presented at the International Plant Propagators Conference in Michigan. 325 nursery managers from across the United States, Canada, Mexico, Korea, Japan, and Australia received training in use of this new IPM technology. Invited to lecture on IPM research at 5 national green industry professional meetings including: Delaware University Cooperative Extension and Delaware Nursery Association conference in Dover, DE, Care of Trees seminar, organized by Chicago office and held in Northern Virginia, national IPM Conference, St. Louis, Missouri, national OFA conference in Columbus, Ohio, Holly Society members at the national meeting. As a result over 1000 green industry professional were trained in new IPM technology research conducted by the University of Maryland Cooperative Extension. An electronic written survey of 950 Maryland green industry professionals receiving electronic IPM report showed that 623 professional horticulturists adopted at least one IPM method and will improve their diagnostic skills. Over 500 green industry professionals improved their IPM diagnostic skills and adopted use of low-risk pesticides for control of pests as measured by a written survey. \$23,895 of unrestricted gifts and grants were obtained from our clientele to expand IPM research and outreach efforts. Over 150 Garden center personnel were trained in IPM diagnostic skills and low risk pesticide options through two seminars conducted in the winter of 2006 as part of 2-day Garden Centers Association Training. Association also gave us \$300 unrestricted gift to expand IPM research efforts. Conducting our first Statewide Green Roof conference, as part of our environmental efforts, in November of 2006. Over 80 green industry representatives learned how to install green roofs, how to maintain green roofs and evaluate the potential pests and IPM methods to keep the green roofs healthy. Improved skills of 27 IPM scouts working with the green industry in Maryland in use of biological control and low risk pesticides through conducting a one day Advanced IPM scouting seminar in 2006 at Brookside Gardens. Obtained \$3100 of unrestricted gift from Waverly Farm to conduct field trials to evaluate 3 fertility rates for 3 field grown nursery species. Involved grower in project, Extension educator, and 2 technicians. Provided lectures to over 160 Master Gardeners (Montgomery, Howard, Anne Arundel, Washington, and Frederick Counties) in diagnosis and IPM skills as part of statewide Master Gardener program. 48 arborists,

landscape managers and nursery managers participating in the January 2006 Advanced IPM program felt capable of operating an IPM program with their clientele as measured by a written survey conducted at the conclusion of the 5 day course offered in College Park Maryland.

Over 900 hundred landscape managers, Garden Center personnel, arborist, nursery managers and professional horticulturist improved their IPM diagnostic skills by attending the conferences and training seminars that we conduct in 2006. Of these people, over 820 received MDA pesticide re-certification credits enabling them to renew their pesticide license for 2006.

Three hundred professional horticulturists were able to identify and deal with new invasive species, Emerald Ash borer, in Maryland because of 2 seminars. -Involved 38 Maryland greenhouse growers in active IPM program and they improved their diagnostics skills and reduce plant losses from insects and disease through implementation of IPM practices in 2006.

Over sixty interiorscape companies from the east coast participated in a MCE, MNLA, and MGGA organized Northeast interiorscape conference and learn IPM methods for dealing with pest. Forty two interiorscape professional had their MDA license renewed as a result.

c. Source of Funding: Smith-Lever 3b&c, state general funds and private grants.

d. Scope of Impact: Multi-County and Statewide.

Project 4.2.5. Home & Garden Information Center

a. Project Description. The Home & Garden Information Center (HGIC) is the main center for providing information & training to citizens of Maryland on environmental, home horticultural and water quality issues. The main focal point for 2006 is to:

- grow the Home and Garden Information Center (HGIC) as a national model for delivery of environmental horticulture information and education.
- Develop and disseminate information on backyard and community food production, integrated pest management (IPM), plant problem diagnosis, composting, soils and fertilizers to MCE staff, HGIC horticulture consultants, Master Gardeners, clientele groups, and the public through classes, demonstrations, applied research, fact sheets, print and electronic media, and the Web.
- Public adoption of environmental horticulture practices- in particular, to reduce unnecessary fertilizer and pesticide use.

b. Impacts. HGIC horticulture consultants assisted, 13,495 clients via phone calls. The HGIC web site had 141,541 individual user sessions in 2006. 125,103 fact sheets were ordered via the website. HGIC consultants reviewed and amended the answers to 948 of the 3,096 e-mail questions received by HGIC in 2006. Provided expertise in numerous subject areas to 8 phone consultants who operate 3-6 HGIC phone lines from 8am – 1pm Monday through Friday, year-round. Analyzed 119 plant and insect samples and

distributed 125,100 fact sheets, 16,800 magnets, and 11,100 bookmarks. Provided training to volunteers in the following areas: 2-week “*Winter School*”; 8 presentations (2-3 hours each) by campus and field faculty and outside speakers; 6 presentations by campus and field faculty on timely topics. Review and approve a newspaper column-“*Ask the Plant and Pest Doctor*”- produced by a HGIC consultant every 2 weeks. Conducted the second annual level II advanced training course in organic vegetable gardening in western MD. Produced and delivered 3p.p. presentations and did 17 hours of classroom and hands-on teaching for 25 learners.

Results from 2006 indicated 87% of the web users identified their problem correctly, 57% thought they would need a pesticide to solve their problem and based on the information from the Center 44% did not need a pesticide, 53% replied that the methods recommended were effective and 60% learned enough to prevent their problem next season. This translates into economic savings, fewer toxics negatively impacting the environment fewer toxic materials that homeowners and landfill operators have to deal with. The same outcome would be expected from a sample of callers to the HGIC “hotline.”

The Center’s Diagnostic Web Site (www.hgic.umd.edu/diagn). The purpose of this site is to enhance the Center’s public outreach and delivery of information on environmental horticulture topics. The Diagnostic Web Site was completely revised and updated in 2005/06. The new site provides visual diagnostic keys that employ color photos to aid users in accurately diagnosing. The technical information was developed and provides the solutions to the problems on pests, diseases, and environmental problems.

c. Source of Funding: Smith-Lever 3b&c, and State Funds.

d. Scope of Impact: Multi-County and Statewide.

Project 4.2.6. UMES - Greenhouse Propagation and Site Technologies for Restoration of Submerged Aquatic Vegetation in Coastal Bays

a. Project Description. This project addresses the area needs in (a) ‘Studies and Experimentation in Food and Agricultural Sciences’ by advancing the science and body of knowledge on sustainable agriculture techniques for resource conservation, aquaculture production of submerged aquatic vegetation, and marketing these alternative crops through the Greenhouse Growers Cooperative. It addresses the need for a (b) ‘Centralized Research Support System’ that coordinates a scientific collection of data from various state and federal agencies to address the selection, management, and conservation of restoration sites for SAV habitat. It also creates a (c) Site Selection Criteria (‘Technology Delivery’) for providing academic and technical support in remote sensing, GIS/GPS, and propagation expertise to collaborative shareholders. This (d) ‘Creative Application’ positions these small farmers (greenhouse producers, aquaculture producers, & watermen) and the University in a leadership role with the expertise and support to significantly contribute and benefit in future commercial restoration activities targeted by the *Estuaries and Clean Waters Act of 2000*(s.835).

b. Impacts. The recovery of submerged aquatic vegetation in our coastal bays is becoming a major environmental priority for these endangered ecosystems. This multi-

disciplinary project is demonstrating the practicality of utilizing existing farmers, with a collaborative relationship with watermen, to develop an economically viable methodology for large-scale restoration projects. The first contract commercial propagation contract for 20,000 SAV plants was completed in 2004 by UMES with 4 industry partners: local independent watermen, the Maryland Seafood Cooperative, the Maryland Greenhouse Cooperative, and Wayfarer Aquatic Nursery. A second SAV contract for 2005, initiating greenhouse construction of 3 high-hoop houses, has been signed with the Maryland Greenhouse Cooperative as part of further commercialization of the technology. Plant material propagated in this Capacity Building Grant has been utilized in the restoration project in the Potomac River basin adjacent to the Woodrow Wilson Bridge project in Washington, DC. Nursery production with mat technology may eliminate the need for collection permits in natural waters.

c. Source of Funding: 1890 USDA Capacity Building Grant # 2003-03906.

d. Scope of Impact: Multi-State.

4.3 Maintain a Water Supply Capable of Supporting Both Commercial and Private Needs Today and in the Future by Protecting and Conserving Surface and Ground Water Resources.

(Key Themes – Drought Protection and Mitigation, Water Quality)

Maryland Cooperative Extension educators developed 149 programs in 23 counties, 3 regions in Maryland, state, multi-state, and national. Topics covered included communities and individuals adopting water conservation practices; and communities and municipalities officials receiving training in ground-water protection standards under the National Drinking Water Act. These programs reached 29,693 people.

Examples of educational programs include the following:

Project 4.3.1. Improve Water Quality Through Water Conservation – Baywise Landscape Management

a. Project Statement. Urban and suburban sprawl has led to the conversion of thousands of acres of native landscape into home lawns and gardens. These lawns and gardens have been developed using sometimes antiquated concepts and techniques that were developed two or more centuries ago. Most residents, planners, and developers do not recognize the urban and suburban landscape as part of the greater ecosystem, and they have generally failed to incorporate environmental and ecological concepts into their landscape plans. This failure has led to the continued degradation of soil and water quality. Also, landscape plantings continue to contribute exotic and sometimes invasive plant species to the ecosystem. Because these plantings generally lack diversity and rely too heavily on mowed turf as a ground cover, they fail to attract desirable wildlife that can add balance to a damaged ecosystem. All told, we have been left with a very unhealthy and unsustainable landscape. Also, studies have shown that both ground and surface waters contain high levels of the nutrients nitrogen and phosphorus (N and P),

sediments and toxic contaminants, which adversely affect water quality, aquatic organisms, fisheries, and human health.

New educational strategies are needed that will first change our view of the urban and suburban landscape, and second show how the environmental and ecological concepts of the late 20th and early 21st century can practically be used to transform these landscapes into a healthy ecosystem.

b. Impacts. In 2006, ninety-five new and nine returning Master Gardeners learned the importance of water quality and how it can be maintained and improved through seven separate Bay-Wise Advanced Trainings in 2006. In end of class evaluations, 90% of Bay-Wise Master Gardeners said they would incorporate IPM, rain gardens, water-insoluble fertilizers and/or other environmentally sound horticultural practices into their landscape maintenance plans. Many of those who said they do not plan to change practices as a result of the class explained that they were already using those practices. Twenty-three Bay-Wise Master Gardeners had their home landscapes certified as ecologically sound demonstration sites in their own neighborhoods, and pledged to encourage others to do the same, as a result of their training.

In addition to the Bay-Wise program, 98 Master Gardeners and nine HGIC phone consultants learned how to key out woody plants during a nine-hour advanced training session. One hundred and one Master Gardener interns learned about native plants, botany, lawn care and an intro to Bay-Wise landscape management during part of their Master Gardener intern training.

Four hundred and fifty Maryland citizens learned how to integrate IPM and other environmentally sound horticultural practices into their lawn and garden maintenance plans. They also learned the concept of landscape ecology. In post-class evaluations, 93% respondents said they would plan, develop and maintain ecologically sound landscapes that increase plant diversity, improve water and soil quality, and provide habitat for desirable wildlife as a result of what they learned.

Maryland Cooperative Extension's Bay-Wise Master Gardeners partnered with the Chesapeake Ecology Center (CEC) in a workshop to install a rain garden and signage at the CEC, which is located at Adams Academy at Adams Park Middle School in Annapolis, Maryland. A filled-to-capacity room of 35 individuals, mostly Bay-Wise Master Gardeners, participated in the workshop, and there was a waiting list of several people. The newly installed Bay-Wise Rain Garden is located at the entrance to the grounds and is highly visible to vehicular and pedestrian traffic.

Twenty-eight hundred and thirty-three Montgomery County fourth graders discovered the connections between water quality, agriculture and their environment during their field day at Close Encounters with Agriculture. Eighty-six youth enrolled in Adventures in science also learned similar facts and promised to reduce the pollution load within their homes.

Eighteen community groups around the state received \$ 17,537 in Maryland Urban & Community Forestry grants to promote and plant trees on public lands.

c. Source of Funding. Smith Lever 3b&c and State General Funds.

Scope of Impact. Statewide

Project 4.3.2. Improve Water Quality – Environmental Stewardship

a. Project Statement. Maryland has abundant water resources. Surface water provides 80 percent of the state’s water supply, however groundwater supplies approximately 85 percent of the total water used in Southern Maryland and the Eastern Shore. Under the Chesapeake Bay agreement, there is to be a 40 percent reduction in nutrient loading into the bay by year 2020. Citizens and homeowners contribute to water quality problems and solutions to improving water quality. As Maryland’s population continues to drastically increase, educating the general public, homeowners and children on how to improve water quality is critical.

b. Impacts. Two thousand five hundred and ninety-one (2,591) fourth graders and their parents & teachers from 29 schools (48% Caucasian, 21% African American, 16% Hispanic, 0.6% other and 14% Asian) learned how their daily actions personally affect local water quality when they visited the Montgomery County Maryland Cooperative Extension office for the “*Close Encounters With Agriculture*” program. This team effort involves all program areas in Extension, the Soil Conservation Service, local farmers and other Extension volunteers and covers three different tracks that all relate to agriculture, i.e., production agriculture, the environment and nutrition. Educator designed and team-taught twelve sessions a day, in the environment track, for the nine-day event. (Educator taught 8 of the 9 days.) Pre- and post-visit exams indicate that the student scores increased from 21% to 60% and teachers rated the event 4.75 out of 5.0 (high).

Twenty-one 4-Hers from Montgomery County’s *Adventures in Science* (AIS) program learned about soil hydrology, where their drinking water comes from and how they can affect the quality of their drinking water. 100% of AIS students surveyed said they would change at least one of their behaviors to improve water quality in their community.

One hundred and eighty-four Maryland garden club members, Frederick County fairgoers, Baltimore County and City residents learned various ways they could lessen their negative impact on the environment in six classes and seminars taught by the educator. No evaluation was administered for these classes.

Upon request, sixteen Brookside Gardens staff members learned several ways to engage youth when teaching them about botany during this three-hour train-the-trainer hands-on workshop. The staff either works directly with youth or trains their volunteers in the youth education program.

c. Source of Funding. Smith Lever 3 b&c and State General Funds.

d. Scope of Impact. Statewide and multi-state.

4.4. Maintain a Water Supply Capable of Supporting Both Commercial and Private Needs Today and in the Future by Protecting and Conserving Surface and Ground Water Resources

(Key Themes - Water Quality and Nutrient Management)

Overview - Research

The contamination of surface and subsurface water supplies due to non-point source agricultural runoff is among the most serious environmental problems facing American agriculture today. About 60% of the rivers and lakes in the United States are polluted by agricultural runoff; rivers primarily by sediments, and lakes by nutrients. Additionally, surface and groundwater are contaminated by a variety of pesticides, and nutrient sources such as fertilizers and manure. One of the challenges for developing economically sustainable agriculture is to simultaneously reduce non-point source pollution problems and maintain farm and rural industrial incomes at reasonable levels. One solution is watershed-scale planning and management which makes it possible to target Best Management Practices (BMPs) for the greatest improvement in water quality even though watershed planning is much more complicated than field or farm scale planning.

As an 1890 Land Grant institution, UMES is committed to continue the services and applied research currently provided to area farmers, watermen and resort residents (Eastern Shore tourism industry). We expect to bridge the agricultural, environment, and renewable natural resource programs and find ways that farmers and businessmen can be economically enhanced while not harming the environment and do so with concern and sensitivity to all facets.

Primary Goals

- Adopt management practices for agricultural production that enhance natural resources.
- Improve the application and adoption of land-applied biosolids, manures, composted materials, and other organic byproducts.
- Improve water quality through the adoption of sound environmental stewardship practices by the public and municipalities.
- Maintain a water supply capable of supporting both commercial and private needs today and in the future by protecting and conserving surface and ground-water resources.
- Promote environmentally sound land use plans that manage growth and value the benefits to society of farms and forestlands.
- Increase recycling and appropriate product disposal.
- Promote the use of rural and urban forest stewardship practices to maintain a sustainable forest resource.
- Improve fish and wildlife habitat and species diversity, as well as promote the use of new management techniques that manage wildlife and control damage to property, crops and people.

Adopt management practices for agricultural production that enhance natural resources.

Because of the intense competition between farming and the urban population in Maryland, much of our work has focused upon the reduction of chemicals and other exogenous inputs to farming systems. In particular, Maryland leads the nation in the development of nutrient management programs for control and reduction of nutrients on cropland. This effort began with the *Pfiesteria* outbreak of 1997 and has focused on the reduction of phosphorus to farmland. Further, due to the high cost of land and labor in Maryland, we have examined ways

to reduce costly pesticide use on both cropland and in the greenhouse. Many of the best programs for reduced pesticide use in the US were developed in Maryland.

Examples of research projects include the following:

Project 4.4.1. Intensive Nutrient Management for Efficient Crop Production

a. Project Statement. Research program explores the fate of nutrients in agro-ecosystems. Efficiency of nitrogen and phosphorus utilization during different phases of numerous crop rotation systems and the evaluation of the potential for nutrient losses from production soils are the primary objectives of this research program. Nutrients applied to agricultural lands, either as purchased synthetic fertilizers, animal manures, or biosolids have three alternative fates: be utilized by the growing crop; be retained in the soil as components of dynamic nutrient cycling processes; or be lost from the soil by water transport or atmospheric volatilization processes. Nutrient losses from soil can result in detrimental impacts on surrounding natural waters including accelerated eutrophication, aquatic habitat degradation, and impairment of drinking water quality. The goal of our research is to maximize the efficiency of crop nutrient utilization while minimizing the potential for nutrient losses from agricultural land.

b. Impacts. The overwhelming majority of the 2 M acres of cropland in Maryland are fertilized with either purchased synthetic fertilizers or animal manures. These nutrient inputs contribute to the cost of production of all commodities. Efficient use of applied nutrients is essential to minimize production costs and sustain farm profitability. Evaluation of nutrient application rate and timing in Maryland's numerous crop production systems permits identification of the most agronomically and economically efficient nutrient management practices. Refinement of soil testing and other methods used to evaluate soil nutrient availability to crops enables managers to more accurately determine the quantity of fertilizer nutrient input necessary to optimize production and yield.

Adequate nutrient availability to agronomic crops is essential for both maximum production quantity and commodity quality. Grain and forage quality is affected by the balance of nutrients available to the crop during its growth. Soil and plant analyses are useful diagnostic tools for evaluation and management of nutrient availability that in turn determines commodity quality.

Although applied nutrients are essential in Maryland's crop production systems, over application of nitrogen and phosphorus may pose an environmental risk. Nitrogen and phosphorus transport from agricultural soils to surface waters can contribute to the eutrophication of these natural water bodies and spark declines in water quality. Nitrogen leaching through soil to groundwater has been documented as a human health hazard as well as an environmental hazard. Management of nitrogen and phosphorus inputs to cropping systems that ensure adequate nutrient availability to the growing crop while minimizing the potential for excess or residual nutrients to runoff the soil surface or be leached out of the crop root zone has been a primary research focus. Management of soils that have historically received over applications of phosphorus and reducing the

potential for phosphorus losses to adjacent water resources is a rapidly expanding research priority.

Preservation of a sustainable agriculture industry in the rapidly urbanizing mid-Atlantic seaboard is a daunting social challenge. Sustainable agriculture is not possible without the use of sustainable nutrient management practices. Environmental protection, habitat preservation, and water quality issues are part of our society's daily conservation and agricultural nutrient management plays a premier role in this social debate.

c. Source of Funding: Hatch Project MD-B-182.

d. Scope of Impact: National.

Project 4.4.2. Constructed Wetlands for Treating Dairy Wastewater

a. Project Statement. The focus of this research is to evaluate the effectiveness of wetlands constructed for treating dairy milk house waste. Data are collected on a suite of water quality parameters from various locations within wetland-based treatment systems. Parameters analyzed include biological oxygen demand (BOD), chemical oxygen demand (COD), nitrogen (ammonia, nitrate, nitrite, and total nitrogen), phosphorus (ortho-phosphate and total phosphorus), total suspended solids (TSS), pH, electrical conductivity, dissolved oxygen, and temperature. These data allow quantification of treatment effectiveness of various components of the systems. Additionally, vegetation is monitored in the wetlands to assess changes in community structure in response to wastewater constituents. Vegetation characteristics monitored include species composition and abundance in permanent plots, species composition of buried seeds (i.e., the seed bank), and standing biomass of dominant species. Because of the importance of peat formation in the retention of certain nutrients (phosphorus in particular), decomposition rates and nutrient retention capacity in various wetland plant species are also monitored. Because dairy wastewater contains high concentrations of ammonia, experimental studies of the toxicity of ammonia to wetland plants are also conducted.

b. Impacts. On a regional scale, it is generally less expensive to implement measures for nutrient and solids control rather than to restore ecosystems damaged by these substances. On a local scale, constructed wetlands may be less expensive to operate than conventional wastewater treatment systems. Additionally, with a trend toward having more animals per unit area of farmland, these systems may also have the benefit of requiring smaller land area than some waste management practices.

A better understanding of the factors controlling the effectiveness of wetland-based treatment systems will improve their design and implementation.

Milk house wastes contain high concentrations of solids and nitrogen and phosphorus compounds. These substances can result in eutrophication of downstream water bodies, damaging or altering aquatic ecosystems and the socioeconomic values that depend on them. Wetlands naturally remove solids and nutrients from water flowing through them, and we are harnessing this capacity to remove potentially damaging substances from wastewater before it is discharged to the environment. We have found that constructed

wetlands significantly reduce concentrations of nutrients, solids, and oxygen demanding substances in dairy wastewater.

Reducing the quantities of nutrients and solids discharged to aquatic ecosystems will improve the health of aquatic animals. Lower nutrient levels may also prevent outbreaks of microorganisms dangerous to human health

Constructed wetlands offer an alternative to energy- and labor-intensive conventional technologies that may be more socially acceptable in some areas.

c. Source of Funding: MAES, USDA/SARE.

d. Scope of Impact: International.

Project 4.4.3. Management systems to improve economic and environmental sustainability of dairy enterprises.

a. Project Statement. The US dairy industry is a changing and dynamic industry. Changes in the infrastructure, workforce, political and social involvement, globalization of markets and culture, and enhanced information, and biological technologies continuously influence the US dairy industry. An understanding of, and ability to adapt to these changes are paramount to ensuring farm profitability, and quality of life. The primary focus is to develop management strategies and decision support systems that facilitate profitable decision making by dairy producers.

b. Impacts. We are developing pertinent databases plus expanding existing databases for performance analyses and to integrate different kinds of data into decision support systems. Core parameters for financial, production, and management databases are being identified. By providing a central data format and storage all researchers can access unified databases including financial databases based on interviews and surveys of dairy producers for management and production data and has established financial benchmarks. These benchmarks are tied to different production systems and used for evaluation. These evaluation systems ultimately will be Web-based and readily accessible.

c. Source of Funding: Hatch, Multistate NC-119

d. Scope of Impact: National, International

Project 4.4.4. Animal manure and waste utilization, treatment, and nuisance avoidance for a sustainable agriculture

a. Project Statement. Minimizing nutrient excretion in poultry with specific focus on phosphorus is a critical issue in poultry management. Finding feed additive alternatives that maximize phosphorus utilization in poultry can assist in mitigating excess nutrient output. With excess nutrients it is important to develop management tools, strategies, and systems for land application of animal manures that optimize productivity and are

compatible with sustained land and water quality and evaluate constructed wetlands, riparian zones, and other vegetative systems for treating animal wastewaters.

b. Impacts. This work shows that excreta phosphorus can be reduced by 17 to 22% if birds are fed at or close to requirements with no apparent negative impact on processing downgrades. When only ingredient costs are considered feeding to requirements can result in a feed cost reduction of 39.2 to 76.8c/ton of feed

c. Source of Funding: MAES, Hatch Multistate S-275

d. Scope of Impact: National, International

Project 4.4.5. Anomalous soil hydromorphology

a. Project Statement. Although soil morphology is often used to identify hydric soils in wetlands, some wet soils do not demonstrate the expected features and are wetter than the soil morphology suggests. We intend to study soil morphology and soil hydrology in atypical situations in order to be able to identify alternate soil morphological features for identifying hydric soils in such settings.

b. Impacts. Soils in landscapes formed in recent alluvium on Mid-Atlantic Piedmont floodplains contain some hydric soils which demonstrate typical hydromorphology and also others that do not. Some hydric soils, that do not currently meet an approved field indicator, do exhibit characteristic redoximorphic features - primarily redox concentrations in a 3 chroma matrix. Three sites located in Maryland and Delaware were instrumented for field measurements and were analyzed for selected lab data. At each site, a transect was identified that included both hydric soils and soils that were non-hydric. Based on three years of data, hydric soils were identified that did not meet a field indicator. Based on work introduced by researchers at Purdue University, a new method for identifying reduced soil environments was utilized during one wet season. This method utilized IRIS (indicator of reduction in soil) tubes coated with a ferrihydrite paint. Dissolution and removal of iron from the IRIS tubes further demonstrated that the soil environment was reduced during these time periods. Based on the work of this study an alternate hydric soil indicator will be proposed for soils on these landscapes. Soils have been identified in the Mid-Atlantic Coastal Plain that are wetter than would be surmised from examining their soil morphological features. These atypical soils are generally loamy in texture and are found at low-lying elevations near by to coastal waters or brackish marshes. Efforts were undertaken to demonstrate whether or not these soils in question are in fact hydric soils and to understand why these soils do not reflect more typical hydromorphological features. In addition, the adequacy of present Field Indicators of Hydric Soils in identifying these soils was evaluated. Four study sites on the Delmarva Peninsula were identified, and at each site, water tables were monitored using automated recording wells and redox potential was measured using Pt electrodes. A laboratory mesocosm experiment was also conducted to further investigate why these problem hydric soils (anomalous bright loamy soils - ABLs) on the coastal plain do not exhibit morphological field indicators. Data collected over two field seasons demonstrated that these soils did meet the technical standard (saturated and reduced) for hydric soils. Application of the Color Change Propensity Index demonstrated that the soils are not inherently resistant to the development of low

chroma redox depletions. Once the data are fully analyzed, a new field indicator will be proposed to address these problem hydric soils. Therefore new field indicators of hydric soils will be proposed to address problem hydric soils conditions on Piedmont flood plains and also in certain geomorphological settings in the Mid-Atlantic Coastal Plain.

c. Source of Funding: MAES, Hatch

d. Scope of Impact: Regional, National

Outcomes and impacts were measured in individual programs. Examples of these follow.

This project attempted to determine the effects of treating soils with agricultural gypsum (GYP); fluidized bed combustion fly ash (FBC) and anthracite refuse ash (AFA) to control phosphorus (P) loss from P-enriched soils on the Eastern Shore of Maryland. It also monitored possible groundwater contamination and, the loss of Nitrogen (N) and P due to surface run-off and soil profile movement following the application of poultry litter to P enriched soils on the Eastern Shore of Maryland.

Project 4.4.6. UMES- The Use of Gypsum-Based By-Products to Improve Management of Phosphorus Losses from Soil

a. Project Statement. Phosphorus (P) pollution from agriculture is a concern to water quality as P causes eutrophication, the biological enrichment of fresh water, and is the leading cause of surface water impairment in the U.S. P management on the Delmarva Peninsula is a major focus of recent environmental regulations. Many Delmarva soils have excessively high levels of soil P due to long term poultry litter application and thusly a high potential for P loss in runoff. Coal combustion by-products (CCPs) are waste materials from power plants that have been used to address agricultural soil issues. When applied to soil, some CCPs have been used to decrease soil P solubility, suggesting that they can also lower P in runoff. The main objective of this project was to determine the effect of applying by-product gypsum to sequester soil P and reduce runoff P at a field scale.

Ten tons of gypsum/acre were added to 2 of 4 plots (0.1 ha each); runoff volume P was measured (dissolved, particulate & total), and sediment loss. Corn and soybean yields were measured at the end of each growing season; round-up ready varieties were used and anhydrous N 120 lbs/acre was applied to corn. The study is being conducted at the UMES Agricultural Experiment Station on a site that had been treated with poultry for approximately twenty-five to thirty years.

b. Impacts. On-shore land use patterns near and adjacent to water bodies contribute to P loading which promotes algal blooms and loss of fish habitats in the Chesapeake Bay watershed. Researchers at the UMES and USDA/ARS at University Park, PA., observed that the application of a gypsum-based coal combustion by-product flue gas desulfurization by-product (FGD) to soils with elevated (P) levels, 1) decreased soil pH, 2) decreased water extractable P but not plant available P in soil, 3) decreased dissolved but not particulate P in runoff, but had no effect corn or soybean yields. After three

years of application, gypsum is still effective in decreasing runoff dissolved P. FGD has the potential to provide a cheap and effective means of reducing pH in high pH soils and nitrification in the Chesapeake Bay watershed. Reversing the latter trend will enhance the ability of watermen to provide quality products in needed quantities, improve the economic viability of Maryland's seafood industry, and promote tourism in the Delmarva Peninsula. After two years of treatments, magnesium deficiency symptoms began to appear in corn which must be corrected for maximum yields.

c. Source of Funding: Capacity Building/CSREES/Evans-Allen and USDA-ARS, University Park, PA.

d. Scope of Impact: Regional-Delmarva Peninsula and National.

Project 4.4.6.b. UMES - The Effect of Phosphorus and Nitrogen - Based Manure Management on Soil and Runoff Phosphorus

a. Project Statement. The continual and long-term application of manure to soils at rates exceeding crop removal can result in an accumulation of phosphorus (P) in soil and exacerbate losses in runoff water. In such cases, recently mandated comprehensive nutrient management plans require manure applications to be based on either an environmental soil P threshold (i.e., 100 mg kg⁻¹ as Mehlich-3 P) related to runoff P potential or crop removal rates of P, rather than previous recommendations based on crop N requirements. Even though P-based manure management is being put in place for high P soils over most of the U.S., there is little data to show that this change in nutrient planning strategy decreases P loss in runoff water. The study was initiated at the UMES Experiment Station in 2000 by establishing 18, 0.1 ha plots in corn or soybean on an Othello silt loam, which already had “excessive” soil test P (480 mg kg⁻¹ as Mehlich-3 P). Soil test P as Mehlich-3 extractable P was determined in March of each year and runoff during each flow event collected automatically with Sigma samplers for all plots and dissolved, particulate and total P measured, as well as erosion and runoff volume. Poultry litter rates were equivalent to about 75 kg P ha⁻¹ for N-based applications, 30 kg P ha⁻¹ for crop removal-based applications and zero for the soil P threshold-based applications. The primary focus of this study was to examine the effect of phosphorus and nitrogen - based manure management on soil and runoff phosphorus.

b. Impact. Alternative manure management required by revised nutrient planning strategies can reduce the potential for P in runoff water. Recent results show that P-based manure management reduced runoff P without decreasing crop yields; for all treatments, Mehlich-3 P remained above environmental thresholds (100 mg kg⁻¹), and runoff dissolved P also remained above eutrophication thresholds for flowing waters (0.05 mg L⁻¹). Continued evaluation of these strategies is still on-going to determine long-term implications to the management of farm nutrients.

c. Source of Funding: CSREES- Evans- Allen and USDA-ARS, University Park, PA.

d. Scope of Impact: Regional-Delmarva Peninsula and National.

Project 4.4.7. UMES - Development of National and International Standards and

Performance Specifications for Protective Clothing Materials

a. Project Statement

- Conducted studies to determine percent penetration through fabric with and without seams. Seams of all garments in our collection were used for the study. Results of the study were used for the development of performance specifications.
- Laboratory data for 130 fabrics and field exposure data provided by CropLife International was analyzed and used for the development of performance specification.
- New work item was initiated after the ASTM Committee meeting in Feb. 2006 for the development of ASTM performance specification. A draft was prepared and permission obtained from ASTM to submit the draft to ISO concurrently for balloting. The ASTM draft was circulated to NC 170 members as well as the ASTM task group members. The final draft entitled “Protective clothing — Performance requirements for protective clothing for horticultural and agricultural pesticide applicators” was submitted to ASTM for sub-committee ballot in Fall 2006.
- Submitted the information required by ISO to initiate a request for new work item for performance specification. The member countries approved the new work item. The ISO draft was circulated to NC 170 members as well as individuals in industry, academia, and governmental agencies in several countries. The final draft entitled “Protective clothing — Performance requirements for protective clothing for horticultural and agricultural pesticide applicators” was submitted to ISO for balloting in Fall 2006.

b Impacts. The new standard test method has the potential to be used by researchers, industry, and organizations in the US and other countries to measure the performance of textile materials against liquid pesticides. International standards and performance specifications will also assist in the selection of appropriate PPE for agricultural workers. The UMES researcher serves as the Technical Contact for the ASTM International standard and performance specification as well as the ISO New work item approved for the development of the performance specification. Laboratory research is being used as a basis for selection of PPE for worker exposure studies.

c. Source of Funding: USDA - Evans-Allen.

d. Scope of Impact: National and international.

Project 4.4.8. UMES - Reduction in Animal Waste Pollution Through the Use of Enzymes to Improve Phosphorus Digestion

a. Project Statement. Work during 2006 continued to focus on the gene component of the study. The following is a summary to date: Tissues were collected from the 72 selected birds and from these birds 12 birds from the high weight and 12 from the low weight groups were identified as having superior or inferior nutrient absorption. RNA was extracted from the 24 specific birds from duodenum, jejunum, and ileum tissues. Micro-arrays, constructed on glass slides, consisting of 3,840 unique chicken intestine cDNAs were screened to determine if differences in gene expression could be

determined between the two extreme weight groups. Focused macro-arrays, constructed on nylon membranes, consisting of 384 unique cDNAs shown to be involved in Calcium and Phosphorus metabolism were further screened to also examine the differences in gene expression between the two extreme weight groups. Several genes (>20) were found to be up or down regulated between the two weight groups across multiple regions of the intestine, many of which have known relationships to Calcium and Phosphorus metabolism. The expression pattern of these genes identified by the array analyses, were verified using real-time quantitative PCR. Further characterization of the impact of these genes on nutrient absorption/utilization is needed. Verification of results by replication of the experiment at lower Ca/P levels is in progress. Final results are being summarized.

b. Impacts. Identification of a genetic marker which influences phosphorus utilization will enable geneticists to evaluate and select lines which may decrease phosphorus excretion.

c. Source of Funding: CSREES - Capacity Building.

d. Scope of Impact: Regional, National, and International

Project 4.4.9. UMES - Characterizing Soybean and Corn Genotypes for Phosphorus Hyperaccumulation

a. Project Statement. In the Delmarva region and most parts of the world, poultry and swine manure provide significant amounts of nitrogen and phosphorous. The use-efficiency of applied P is, however, generally very low, ranging from 10% to 30% in the year of application. Continuous application of P fertilizers also increases the risk of P loss from soil to water and has a large number of ecological side effects. In Delmarva region, the application of poultry manure in crops is a widely used practice. It has been emphasized that poultry manure application should not adversely affect the environment. The major concern has been the movement of phosphorous (P) from soils receiving manure applications into ground waters, drainage ditches and ponds and subsequently causing degradation of aquatic systems. Eutrophication restricts water use for fisheries, recreation, and industries due to increased growth of undesirable algae and aquatic weeds, oxygen shortages caused by their deaths, and decomposition. Recently the increasing number of surface waters in the Delmarva region has experienced periodic and harmful blooms (e. g. Cyanobacteria and Pfiesteria) which contributed to fish kills, unpalatability of drinking water, and formation of carcinogens during chlorination and links to neurological impairments in humans. The accumulation of excess soil P concentration is also due to the repeated application of animal and poultry manure onto the same field. It is both expensive and time consuming to transport animal manure. It is convenient for the producers to apply manure to the fields close to the production facility. This often results in a buildup of soil test P above amounts sufficient for optimal yields, which can increase the potential for P loss in runoff as well as in leachate. The east coast, where there is a concentration of poultry production, has a large production of excess farm- level P. One of the important management strategies is to improve the plant uptake of P from soils and enhance the use efficiency of P fertilizers. Genetic variation in P uptake has been reported in various crops

such as soybean. The approach to reduce high P accumulation in soil and its undesirable environmental consequences is by the adoption of plant-based P remediation strategies. The potential of various genotypes of fodder soybean for nutrient uptake from the soil which had received heavy amounts of poultry manure in the previous years was explored in this study.

Field trials will be conducted during 2007 growing season at two locations using the soils which had received heavy amounts of poultry manure and the soils without any application of poultry manure or fertilizers. The experiment will be conducted in split plot design with four replications. The crop plants to be used in the experiments will include genotypes of fodder soybean, corn, sorghum, cowpea and sudangrass. The experiments will be conducted at the same locations which were used in the previous seasons to confirm the results. The biomass yield will be recorded at grain or pod formation. The heights of plants will also be recorded. A sample of plants harvested from the central two rows will be dried and after grinding, it will be analyzed for the extraction of phosphorus and other nutrients from the soil. Soil samples will be taken before planting and after harvest to analyze for various

c. **Impacts:** The experiment will provide information about the plant species which extracted maximum amount of phosphorus from the poultry enriched soils. Corn and soybean are two main crops in the Delmarva region but there is very little information about their ability to extract P from the poultry litter enriched soils. Results of experiments will determine which genotype of a particular crop extracted the maximum amount of P. The soil analyses will also provide data which will be useful for growers to estimate the P removal by various genotypes of crop plants. The potential of various corn, sorghum and Sudan grass was exploited to find out the genotypes which have the maximum potential of P.

c. **Source of Funding:** USDA, Evans-Allen.

d. **Scope of Impact:** Regional and National.

Project 4.4.10. UMES - Direct Incorporation of Poultry Litter into No-Till Soils to Minimize Nutrient Run-Off to the Chesapeake Bay

a. **Project Statement.** Land application of manure is one of the most sensitive and important water quality issues facing livestock farmers in the Chesapeake Bay Watershed today. Historically, spreading livestock manure on agricultural soils has provided farmers with an economical means of supplying nutrients and organic matter to soils and crops. However, a large body of research has revealed how application of manure to soil can enrich nitrogen (N) in groundwater and phosphorus (P) in surface runoff. In the coastal plain soils of Maryland's Eastern Shore, leaching of P is also a significant source of P in ground and surface waters. In watersheds surrounding the Monie Bay Component of the Chesapeake Bay Reserve, application of poultry litter to no-till soils represents a major source of dissolved nutrients that readily accelerate eutrophication. No-till agriculture has been expanding throughout the Chesapeake Bay Watershed, promoted by state and federal extension agencies to reduce soil erosion, increase soil organic matter and biological activity, improve rainfall infiltration and moisture retention, decrease labor requirements and increase farmer profits. However, in areas where manures are routinely land applied, the potential for no-till to exacerbate dissolved

nutrient losses in runoff is well established. Water soluble nutrients in surface-applied (broadcast) manure tend not to interact with soil, which limits their mobility, and instead are readily available to runoff water. Dissolved forms of N and P in manures are highly bioavailable, and therefore of greatest concern to eutrophication.

Injection of manure has been identified as a key to combating the accumulation of water soluble nutrients at the surface of no-till soils. For instance, it has been reported that dissolved P was up to 30 times higher in runoff from soils where poultry manure had been surface applied than in soils where manure had been incorporated. In addition to minimizing dissolved nutrient runoff manure injection reduces ammonia volatilization and odor and can improve crop yields by placing manure nutrients in the rooting zone. At present, a variety of injection systems are available for liquid manures, but no injection system has existed for dry manures (e.g., litters). Consequently, poultry litter continues to be broadcast to no-till soils, exacerbating non-point source nutrient pollution. This project seeks to develop a poultry litter incorporator for no-till soils of the Atlantic coastal plain. The project seeks to improve water quality in the Chesapeake Bay through the development of a litter incorporation technology that will minimize nutrient loss from no-till soils. The proposed research entails two specific objectives: 1) Develop injection technology to enable the direct incorporation of poultry litter into no-till soils found in coastal plain watersheds draining to the Chesapeake Bay, and 2) quantify the effect of the new litter incorporation technology on phosphorus and nitrogen losses in surface runoff and leaching from no-till soils found around the Monie Bay Component of the Chesapeake Bay Reserve.

b. Impacts: The proposed technology is viewed as important tool in helping agriculture, particularly small poultry farms, to comply with federal and state regulations. At a federal level, total maximum daily loads (TMDLs) have been developed for many of the watersheds discharging to the Chesapeake Bay. For instance, the Manokin River Watershed has a TMDL for N. The litter incorporator will aid farmers in coming into compliance with TMDL-related mandates. In addition, USDA-NRCS's 590 standards and the Maryland Water Quality Improvement Act require farmers to comply with nutrient management standards, including improved manure management to minimize non-point source nutrient losses. One area where no-till farmers have had particular difficulty coming into compliance is in manure application. It is anticipated that the litter incorporator will directly address these standards. For instance, the Maryland P Site Assessment Index (promulgated as part of the Maryland Water Quality Improvement Act) provides credits for farmers who immediately incorporate litter in comparison with those who broadcast their litter.

c. Source of Funding: UMES Agricultural Experiment Station, USDA/ARS, University Park, PA, and CICEET.

d. Scope of Impact: Statewide, and National

Project 4.4.11. UMES Controlling Odor and Nutrient Losses to Surface Runoff, Groundwater and Air with New and Conventional Manure Injection Technologies on No-Till Soils

a. Project Statement. Land application of manure is one of the most important

conservation issues facing livestock operators in the Chesapeake Bay watershed today. A large body of research has revealed how application of manure to soil can enrich nitrogen (N) in groundwater or phosphorus (P) in surface runoff. Recent changes in criteria for air quality regulations have made ammonia (NH₃) volatilization from livestock manure a priority issue. Manure can also impact the emissions of the greenhouse gas nitrous oxide (N₂O). An ever-expanding suburban fringe has resulted in a growing number of odor complaints. These concerns highlight the need to understand environmental and agronomic trade-offs when developing conservation strategies.

Practices that control one conservation concern can exacerbate another. Federal, state and local extension agencies have promoted no-till to reduce erosion, increase soil organic matter, improve rainfall infiltration, decrease labor requirements and increase farmer profits. No-till and grassed soils account for 54% of the agricultural land area in the Bay watershed. When manure is applied to these soils, it is generally surface applied. Surface application of manure can decrease nitrate leaching to groundwater and N₂O emissions, relative to incorporation, but it can exacerbate losses of NH₃, odor emissions and dissolved nutrient runoff. Farmers broadcasting manure are sometimes recommended to periodically till their soils to reduce nutrient runoff. However, the soil-quality and environmental benefits of no-till are lost with tillage. Thus, the challenge is to find methods of manure incorporation that reduce P runoff, NH₃ loss and odor emission but leave crop residue on the surface to protect soil from erosion and to retain the biological integrity of the no-till system.

This project tests the environmental and agronomic effects of several manure application systems to identify systems that best address priority environmental concerns without creating unexpected problems. Surface application is the predominant method of liquid manure application on farms in much of the Chesapeake Bay Watershed. This method is thought to result in the greatest potential for P runoff, NH₃ volatilization and nuisance odors. As a result, surface application followed by tillage incorporation is sometimes recommended to control dissolved P losses, NH₃ volatilization and odors. One alternative to surface application and tillage incorporation now advocated by PA-NRCS is surface application followed by a rotary harrow, which results in shallow incorporation of manure with minimal removal of surface residue. Shallow disk injection reduces soil disturbance relative to traditional, deeper injection methods and may therefore be applicable to no-till settings. New disc injectors promise to overcome limitations of earlier designs. Pressurized injection, developed in Norway and not yet introduced to the US, incorporates slurry without using metal implements to open the soil. Pressurized injection is particularly well-suited to injecting slurries into steep and stony soils and can reduce NH₃ loss by up to 90% relative to broadcasting. Aeration-infiltration enhances manure infiltration into soil by creating perforations (pits) in the soil surface that serve as infiltration points for applied manure. This system has been shown to reduce NH₃ and odor emissions in certain circumstances.

This project seeks to provide essential information for the development of conservation strategies that improve on-farm nutrient use efficiency and minimize nutrient losses to the environment. Objectives are, 1) concurrent measurement of applicator effects on odor emissions and nutrient losses to runoff, leachate and air, 2) modeling of alternative manure management strategies on representative dairy and swine farms to assess costs and benefits of different applicators, and 3) outreach and extension activities to promote

technology transfer of manure application systems that best address environmental and agronomic concerns in the Chesapeake Bay watershed.

- b. Impact:** This project is anticipated to have positive environmental impacts, with baseline practices that are currently common in agriculture. This project has broad transferability to any area where liquid manure is land applied. Dairy and swine farmers are key beneficiaries of this project, as are contract manure applicators, whose role in nutrient management is increasing rapidly. Recommended application systems should reduce NH₃ and odor by at least 80% compared with surface applied manure. In addition, we expect recommended systems to lower nutrient runoff by 20-60% compared with conventional methods. Erosion should be at least 90% less with the recommended systems compared to surface application and tillage. We will work with eight conservation districts to get recommendations from this project to producers and contract applicators. A primary goal is to transfer the recommended technologies to producers and contract applicators through meetings, field days and fact sheets.
- c. Source of Funding:** UMES Agricultural Experiment Station and CIG
- d. Scope of Impact:** Statewide and Regional

4.5. Promote the Use of Rural and Urban Forest Stewardship Practices to Maintain a Sustainable Forest Resource.

(Key Themes – Forest Resource Management, Natural Resources Management)

Maryland Cooperative Extension educators developed 42 programs in 23 counties, 3 regions in Maryland, state, multi-state, and national. Topics covered included forest landowners, youth, urban citizens, and conservation groups gaining knowledge in forest stewardship; urban forestry; forest landowners developing and implementing a forest management plan; forest landowners gain knowledge about alternative income enterprises; and natural resource professions will gain knowledge and enhance skills in forest management, alternative income enterprises, technological applications, and public policy conflict resolution. These programs reached 5,734 people.

Examples of educational programs include the following:

Project 4.5.1. Protecting and Profiting From Forestlands – Forestry Correspondence Course

a. Project Statement. Forests cover 41 percent of Maryland. Nearly all of this forestland (90 percent) is in the hands of 130,600 private, non-industrial landowners. Increasing fragmentation of these land parcels threatens forest viability. The forest products industry is the fifth largest manufacturing industry in the state, providing more than 42,000 jobs and \$4.5 B in total output.

University of Maryland faculty educate forest landowners about how to care for and profit from their property through seminars, workshops, correspondence courses, web sites, publications, newsletters, videos, and other educational efforts. One newsletter,

Branching Out, reaches 5,000 private forest landowners throughout the state. A network of trained volunteer forest landowners assist in this effort by sharing information with other forest landowners, citizens, and communities through the Coverts Project outreach program.

b. Impacts. Three hundred fifteen (315) landowners have increased their knowledge of forestry and forest stewardship through the Maryland Forestry Correspondence Course. It is estimated the course has saved participants more than \$160,000 by increasing their knowledge of forestry practices. There were 50 participants enrolled in the 2006 spring and fall semesters, of which eight rolled over from previous semesters. Of these 2006 participants, 40 completed this non-credit course receiving a Certificate of Completion. While most of the participants were Marylanders, others were from Arizona, California, Canada, Idaho, Rhode Island, West Virginia and Virginia. Through this course, these landowners developed a greater understanding of their forests, determined their own goals and objectives for their woodlands, and gained the knowledge and tools necessary to design a management plan. They were furnished the resources necessary to implement their forestry practices. This course provided participants the opportunity to gain greater insight and appreciation for their natural environment, as well as an increased understanding as to how their actions impact their natural resources and economic interests for themselves and future generations. Participants were generally pleased with the course as witnessed by positive marks on the evaluations and comments received throughout the course. Many participants expressed satisfaction and enjoyment with the course and with learning about their forests.

75% stated they would initiate or update a forest management plan for their property; 6,890 would change or adopt new forest management practices; 75% would talk with other family members about the management of land; and 40% would seek the advice of a professional forester.

This course is being converted to a web based course and will be offered in the Fall of 2007.

c. Source of Funding: Smith-Lever 3b &c and RREA.

d. Scope of Impact: Statewide.

4.6. Improve Fish and Wildlife Habitat and Species Diversity, as Well as Promote the Use of New Management Techniques that will Manage Wildlife and Control Damage to Property, Crops, and People.

(Key Themes – Wildlife Management)

Maryland Cooperative Extension educators developed 29 programs in 23 counties, 3 regions in Maryland, state, multi-state, and national. Topics covered included rural landowners gain knowledge of wildlife management and improve wildlife habitat; urban citizens improve knowledge of urban wildlife management; natural resource professionals gain knowledge and improve their skills in wildlife management; urban and rural homeowners and agricultural businesses increase knowledge and understanding of deer and other problem wildlife species

and employ wildlife damage control techniques; and local governments gain knowledge about deer and develop successful management strategies. These programs reached 3,668 people.

Examples of educational programs include the following:

Project 4.6.1. Reforestation at Western MD 4-H Center

a. Project Statement. In partnership with the Department of Natural Resources and the Garrett Soil Conservation District two reforestation projects for the Western Maryland 4-H Education Center continued through 2006.

b. Impacts. The projects will supply 10,000 native trees to replant an area of forest clear cut in 2003. The area will become a silviculture planting demonstration site to study the effects of fencing, tree shelters, and terminal bud protection. The second project will include youth service opportunities in the planting and monitoring young trees to replant and replace older damaged trees in the hickory grove and picnic grove. Youth will plant seeds and transplant young trees to the site. A additional feature of the project will be the development of an arboretum featuring native tree species.

Grant funding in the amount of \$19,671 has been committed. Additional in-kind support for planning will be provided by the partner organizations and youth volunteer.

c. Source of Funding. Smith-Lever 3B&C, state of MD DNR, Garrett County, and state general funds.

d. Scope of impact. County specific.

Project 4.6.2. Coverts Program

a. Project Statement. There are 135,000 private forest landowners in Maryland who own 78% of the forest resources, which provide forest products, wildlife habitat, recreation, open space and other benefits to all Maryland citizens. Only an estimated 10% have a written forest stewardship plan to guide their activities, and fewer than 30% seek the assistance of a professional forester before harvesting timber. Many forest landowners have a greater interest in wildlife rather than timber production, but lack knowledge of how to use harvesting, tree planting, and other management practices to improve wildlife habitat. They also lack knowledge concerning whom to contact for assistance and they may be suspicious of government agencies. However, many will value advice from a peer or relative.

Training carefully selected volunteer opinion leaders in local communities leverages limited Extension resources by building capacity through volunteerism. Using local networks and organizations, trained volunteers can demonstrate sound forest and wildlife management practices and connect other landowners with professionals and information that can help them reach their objectives. A 3.5 day volunteer training workshop has been offered annually since 1990 for a carefully selected group of up to 30 opinion leaders from across Maryland who are forest landowners or managers. Continuing education and instruction is provided. A total of 385 volunteers have been

trained who own a total of 68,452 acres. The goal is to use volunteers to teach Maryland's forest owners and managers how sound forest management can improve wildlife habitat and other forest benefits.

b. Impacts. Based on an annual survey of past volunteers, workshop evaluations, as well as personal feedback from cooperators. Maryland cooperates with the 11 other Northeast states to offer regional meetings, a list-serve, and other opportunities for sharing. Based on the 2006 survey sent out to 230 cooperators with a 25% return rate the following was found. Results indicate: 11% prefer not to use email as the primary means of communication; Volunteers share forest and wildlife information on a one-to-one basis with 2,230 people. 8,223 people received information or heard about Coverts Project from cooperators overall; 43% had organized some event that included forestry or wildlife information; 34% had used the media to inform others about forest stewardship; 23% had distributed business cards and 5% shared the website with others; 77 % took steps in managing their own properties.

Cooperators spent 9,000 hours per year managing their own properties. Using a value of \$15 per hours, that equals \$135,000. Volunteers spent 2000 hours per year in outreach-related activities, which equals \$30,000 (or about one full-time FTE). 20% of cooperators reported that others sought forestry assistance as a result of a contact they initiated. An average of 468 acres was affected by these efforts. Organizations such as the Maryland Tree Farm Committee, Maryland Forests Association, Partnership for Sustainable Forestry, Maryland Forestry Boards, and woodland owner associations are populated with Coverts graduates who acknowledge their involvement was initiated by the training.

Two informal woodland owner associations have been initiated as a result of Covert activities and the Forestry Short Course. The Maryland Woodland Owners Association in Frederick County has an active steering committee and offered three educational programs in 2005. The Baltimore County Forest Landowner Network was formed in Baltimore County as direct result of Covert Cooperators and a few who attended the Harford County forest short course in 2004. The group has a mailing list of 100 people who have attended the one educational programs offered in 2006.

c. Source of Funding. Smith-Lever 3B&C and state general funds.

d. Scope of impact. County specific.

Project 4.6.3. UMES - Reference Collection of Fish Biodiversity

a. Project Statement. This project provides enhanced experiential learning through field-based laboratory exercises for baccalaureate students at the University of Maryland Eastern Shore (UMES) through field sampling and maintenance of a teaching collection of fishes. The University of Maryland Eastern Shore does not have an adequate collection of fish specimens, scientific literature, or taxonomic guides to train future scientists pursuing careers in fishery food sciences. The development of such a collection enhances the opportunity for students to learn and then be competitive for positions with natural resource agencies and universities.

b. Impacts. This project has funded research and field experiences for 10 graduate students, 9 undergraduate students, and 2 faculty members of UMES. A total of 4 undergraduate students have been hired to participate on the project at some point throughout the project. A website with available photos of specimens is currently available to the nation and has been advertised through the UMES LMRCSC website. The website also hosts 4 videos given by students enrolled in Ichthyology (Fall 2006) and a downloadable book called *Running Waters*, which illustrates common fishes of Maryland (marine and freshwater habitats). The project has forged an alliance among Blackwater National Wildlife Refuge (U.S. Fish and Wildlife Service), University of Arkansas Pine Bluff (UAPB), and UMES. Specimens for the reference collection have been obtained from streams of Arkansas and throughout the Delaware-Maryland-Virginia Peninsula. A graduate student assigned to the project is beginning research during 2007 to assess how watershed level changes impact growth of fishes in Blackwater River drainage. Agricultural run-off may result in increased nutrients and lowered dissolved oxygen levels, which may impair growth of food fish such as white perch, *Morone americana*. In part, the project has also helped fund research by a current graduate student exploring how land use and water quality affect the recruitment of Atlantic menhaden, an important resource for the State of Maryland. The project has also provided the impetus for the creation of a new course for UMES (i.e., Ichthyology), which is both an undergraduate and graduate level course. During summer 2006, a group of students visited UAPB and surveyed mountain streams for fishes. Those specimens were maintained in the reference collection. Portions of the reference collection were shared at local events, such as Ocean City's (Maryland) Spring Fest, Baltimore Aquarium's, *Back to the Boardwalk*, and recruitment fairs.

During Summer 2007, additional trips to Monie Bay (a National Estuarine Research Reserve), western Maryland state parks, and Assateague State Parks will result in more fish collection and more student training. The educational capacity of UMES's Coastal Ecology Teaching and Research Center was enhanced by addition of teaching tools (e.g., fish skeletons), stools, field sampling gear, water quality monitoring devices, and a library of contemporary books on fish health, aquaculture, land management for waterways, and taxonomic guides. These books will be available to students and the general public at the Coastal Ecology Teaching and Research Center.

c. Source of Funding: CSREES-Capacity Building Grant.

d. Scope of Impact: Regional/National.

Part A. Planned Programs (continued)

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

Overview.

Maryland youth, families, and communities are the core components in increasing quality of life and economic opportunity. Currently, 13 percent of Maryland children ages 18 and under live in poverty. A single parent heads more than one fifth of families with children.

The current welfare-to-work effort in Maryland requires families to develop the skills and resources needed for independent living by placing a 60-month maximum time limit for welfare benefits. As parents leave welfare to go to work, additional childcare providers are needed.

The process of public decision-making is currently a significant issue for Maryland citizens and policy makers alike. Land use, food safety, and childcare are examples of potential issues involving public decision-making. Because of the inherent difficulty of the situation, it is not uncommon for critical public decisions to be postponed, indefinitely tabled, or solved in uninformed ways.

Societal and governmental needs are growing more complex, fractionated, and global. Increasingly, citizens are asked to share leadership roles in their communities. New and replacement intergenerational leaders must be prepared for these civic challenges. Youth and adult leaders must have the skills, confidence, and ability to lead diverse groups in difficult situations involving polarization of opinion, civic disengagement, and conflict. Youth civic engagement, youth-adult partnerships, and youth empowerment have become significant issues.

Volunteers provide educational, economic, and social benefits to families, individuals, organizations, and communities. Over 3,500 adults and 1,000 older teen leaders serve as Extension volunteers. Effective selection, training, involvement, and guidance are essential steps in maintaining and strengthening volunteer efforts.

The primary goals are:

- Resolve differences between competing interests/conflict management.
- Increase ability of Extension faculty to lead public issues education programs.
- Increase the ability of Extension volunteers to successfully carry out Extension programs.
- Adopt effective leadership practices and strengthen leadership competencies.
- Strengthen skills and knowledge to achieve economic stability.
- Develop and accept individual, parental, home, financial, and/or community responsibility through work, family, and community involvement.
- Enhance the attractiveness of Maryland youth to potential employers to enable youth to be productive, contributing members of a global society.
- Increase the ability of Maryland youth to have caring relationships with family members, peers, and others in their communities.
- Increase the ability of Maryland youth to be competent youth leaders with a strong commitment to civic and social responsibility.
- Strengthen Maryland youth's understanding of the importance of good health and safe and healthy lifestyles.

Outputs.

Maryland Cooperative Extension educators developed approximately 3,000 educational programs, which were held in all 23 counties, Baltimore City, all regions in Maryland, statewide, multi-state, and national. Topics covered were youth development, volunteer leadership and development, strengthening family life, family economic stability, parenting and child-care, welfare-to-work, public issues education, training of local officials, and resolving differences, workforce preparations, character education, civic engagement. These programs reached approximately 190,000 people.

Outcomes and impacts were measured in individual programs. Examples of these are in the following section.

Partners in these programs included numerous youth-serving agencies and groups, all public schools systems, childcare provider organizations, National 4-H Council, county health departments, the Maryland Department of Health and Mental Hygiene, county social services departments, the Maryland Department of Human Resources, the Eastern Shore Health Education Center, the financial industry (private and non-profit) and many additional governmental, NGO's, and private sector agencies, organizations, associations and businesses. Cooperation with other members of the land grant system included VA, UDC, and all states in the NE Extension Region.

A few examples of the many public issues around which MCE has recently worked include:

- Riparian buffers;
- Public drainage on the Eastern Shore;
- Grandparents as parents;
- Availability and access of affordable child care;
 - Healthy lifestyles;
 - Community leadership development;
- Affordable rental housing;
- Agricultural conservation and commodity policies.

Maryland's own assessment of accomplishments. Maryland Cooperative Extension is accomplishing the goals of their five-year plan. There is a balance of educational programs among the various goals and the Extension Administration Team is pleased with the accomplishments. Evaluations of outcomes from the five-year plan are conducted at the individual program level, not at the level of an aggregated REE goal.

5.1. Enhancing Rural Economic Opportunities

Maryland Cooperative Extension educators developed 26 programs, which were held in 12 counties, Baltimore City, all three regions in Maryland, statewide, multi-state, and national. Topics covered were identifying policy alternatives and their consequences, negotiating skills, identifying common ground, planning and implementing steps to reduce friction, appraising community benefits resulting from resolution of differences. These programs reached approximately 900 people.

Examples of educational programs include the following:

Project 5.1.1. UMES - Developing Rural Economic Strategies

a. Project Statement. Business and job retention and expansion are critical to nine Eastern Shore counties. MCE Rural Development Center at UMES in cooperation with counties has received over \$14 M in grants to provide: revolving loans, technical and marketing assistance, research, feasibility studies, planning, heritage and nature-based tourism, and micro-business assistance.

b. Impact.

- Invested \$1.8M in 200 Eastern Shore development projects (average \$11,279 investment) and leveraged \$10.3M in local share investments, total of \$12.1M.
- Lent \$14M to over 60 manufacturing businesses in cooperation with the 4 Lower Shore Counties. Leveraged \$80M private lending. Impacted 4,500 jobs.
- Assisted the 4 Maryland designated counties (Caroline, Dorchester, Somerset and Worcester) to develop implementation plans for funding under the program.
- Adoption and implementation of 4 county Comprehensive Economic Development Strategies.
- Obtained for Maryland Hawk Corporation an affiliated UMES non profit an EDA \$75,000 near-equity fund operations grant, a Rural Development USDA \$55,000 capitalization grant and a State Maryland TEDCO grant of \$25,000 for operations.
- Obtained \$208,000 Economic Development Administration (EDA) US Department of Commerce grant funds to assist with 34 economic development projects that have leveraged \$11.44 million in local and other project funds.
- Obtained \$250,000 USDA national funds to assist 15 local economic development projects that have leveraged over \$4 million other investments.
- Obtained \$295,000 USDA national funds to begin the development of a Submerged Aquatic Vegetation (SAV) commercial grow out and transplanting industry.
- Obtained \$20,000 EDA grant that has leveraged a \$20,000 State of Maryland DEBD grant to conduct in cooperation with the local county economic development units an industry cluster analysis.
- Obtained two (2) \$25,000 State of Maryland MAERDAF fund grants for the City of Cambridge and Somerset County for economic development projects.
- Obtained a \$290,000 USDA national grant from the Rural Business-Cooperative Service that has assisted in the development of 15 cooperatives.
- Obtained a \$166,667 Small Business Administration (SBA) legislative earmark@ as part of Maryland Technology Development Corporation (TEDCO), Maryland Technology-Based Rural Business Incubation Initiative, \$500,000 SBA earmark.
- Received a five-year subcontract agreement for \$667,000 with Land O'Lakes cooperative for five southern African countries under the USDA and USAID, Farmer to Farmer program.
- Obtained a \$125,000 HUD grant to assist Delmarva Low Impact Tourism Experiences a three state regional organization promoting nature-based tourism.

c. Source of Funding. Smith-Lever 3b& c, 1890 Extension, state general funds and USDA Rural Development grants.

d. Scope of Impact: State of Maryland, particularly the Eastern Shore. Multi-County Specific.

5.2. Adopt Effective and Responsive Policies and Programs; Increase Ability of Extension Faculty to Lead Public Issues Education Programs; Increase the Abilities of Extension Volunteers to Successfully Carry out Extension Programs

(Key Themes – Community Development, Public Issues Education)

Maryland Cooperative Extension educators developed over 193 programs, which were held in 23 counties, three regions in Maryland, statewide, multi-state, and national. Topics covered were policy development, public issues processes, conflict management, negotiating, and collaboration skills, framing public policy issues and including public issues education (PIE) in scope of work. Also, strategic planning processes, financial management, performance measures, and organizational climate, assessing local needs, evaluating the effectiveness of programs as part of the "*Excellence in Governance Certificate Program*." These programs reached approximately 23,865 people.

Examples of educational programs include the following:

Project 5.2.1. Managing Growth in an Urban State-Strategic Planning for Jurisdictions and State Agencies

a. Project Statement. Maryland has two regions identified as the second-most and the ninth-most threatened farming regions by an American Farmland Trust report. The Maryland Office of Planning predicts that if current trends continue, 500,000 more acres of open land will be lost to development over the next 25 years (Bay Journal 1997).

University of Maryland faculty developed a multi-disciplinary research effort in the Patuxent watershed to analyze the evolution of land-use change. Their goal: to determine how policy mechanisms, land-use controls, nonpoint source pollution regulations, wetland permitting and transportation affect farmland loss and residential development patterns. They also developed farmland-owner workshops on tax issues related to agricultural land preservation.

b. Impacts. Increased citizen and farmer involvement in the development of comprehensive plans. Legislation introduced in Maryland House to grant tax-free easement payments. Assessment of important agricultural lands needing protection improved.

In 2006 a new focus team was developed called CLUE (Collaboration for Land Use Education) in cooperation with the MD Sea Grant Program. This team hosted a Land Use Meeting, Cambridge, MD, December, 2006. National, regional and local speakers created an awareness of planning issues as Dorchester County faces pressures of development. Topics included "Sense of Place", Basic Principles of Development and

Reality Check report, Cost of Community Services, Better Site Design and Visioning for a Rural Community on the Eastern Shore: Vienna, MD. These topics addressed issues of concern in the County. The Dorchester Planning Commission, a representative from the Dorchester County Council, various city and county agencies, and citizens from Dorchester, Wicomico, Talbot, Queen Anne's, Somerset, Kent, Anne Arundel counties and the state of Virginia attended (38). As a result a comprehensive land use plan was developed for Dorchester County and Cambridge citizens rallied against a major development proposed in prime farm land. Extension educators/agents also participated in a visioning exercise called "Reality Check Plus" designed to help regional leaders and organizations think collectively about how to plan for future growth. Privately sponsored by Urban Land Institute, 1000 Friends of Maryland, and the National Center for Smart Growth and Education at University of Maryland, and 130 other organizations in Maryland.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: State of Maryland.

5.3. Adopt Effective Leadership Practices; Increase Leadership Ability of Youth, Adults, Extension Personnel

(Key Themes – Leadership Training and Development, Youth Leadership, Youth-Adult Partnerships, Youth Empowerment)

Maryland Cooperative Extension educators developed over 128 AGNR related programs and reached over 5,400 people. which were resulting in over 252 AGNR related presentations held in 23 counties, Baltimore City, three regions in Maryland, statewide, multi-state, and national. Topics covered were assessing leadership skills, team building, conflict management, communication, personnel and volunteer management, motivation, and team building.

Examples of educational programs include the following:

Project 5.3.1. Developing Community Leaders - LEAD Maryland

a. Project Statement. The world is becoming increasingly complex. People communicate more quickly, are increasingly interdependent, and turn more quickly to litigation when they are in conflict. As Maryland's communities adjust to these changes, the value of effective leadership rises. University of Maryland Extension faculty are involved in offering public leadership development programs for various communities in Maryland. Partners in the program include the College of Agriculture and Natural Resources, the Maryland Department of Agriculture, the Maryland Farm Bureau, the Maryland Grain Utilization Board, and the Maryland Agricultural Education Foundation. The purpose of *LEAD Maryland* is to provide men and women interested in agriculture the opportunities to improve leadership, develop a network of diverse people, and increase understanding of critical issues. Twenty-three Fellows were selected for the 18-month program. The students completed 8 three day seminars, a three day trip to Washington DC, and a ten day international study trip. Teaching methods included field visits, assessments, panels, case studies, presentations, and self-

discovery. Following completion of an application process and interviews, 23 new Fellows were selected to start Class IV in January 2006. Class III graduated the spring 2006.

b. Impacts. All 23 Fellows of Class IV will complete the 37-day program in spring of 2007. At the end of the Class III program, Kellogg Foundation met with the Fellows and published a written report commending the program. Three of the Fellows were elected to the *LEAD Maryland* Advisory Board. All of the graduates continue to be involved in nurturing the program and mentoring the new Fellows. The program has attracted support from over 15 local, state and national organizations.

c. Source of Funding: Smith-Lever 3b&c and state extension funds and over \$220,000 from non-profits and foundations; tuition from Fellows.

d. Scope of Impact: State of Maryland

Project 5.3.2. Baltimore City 4-H Teen Corps Leadership Program

a. Project Statement. The Baltimore Full Partners (Maryland Cooperative Extension-Baltimore City 4-H, Fellowship of Lights Youth and Community Services and the Safe and Sound Campaign) collaborated to strengthen Baltimore City communities through partnerships and increased opportunities for youth. Educator co-authored and implemented the logic model framework and secured funding from the Kellogg Foundation. This comprehensive leadership-training program continued in 2006 with very positive results similar to past years including almost 50 youth and 30 adult AmeriCorps volunteers. Educator trained youth and adult members in the areas of leadership development, entrepreneurship, service-learning, lesson plan development, public speaking, resume writing, conflict resolution, cultural diversity, community organizing, action planning, and team building. As a result of these efforts, from 1999-2003, youth and adults partnered to establish twelve 4-H sites throughout the city. Each year 120 youth were served weekly at these sites over an 8 month time frame. A core element in the program was a monthly meeting that brought 4-H groups from the 12 sites together in one location. Trained teen Corps members facilitated discussion on various youth development topics and assisted in the planning and implementation of city-wide events. City-wide events such as Safe Night USA, Study Circles Training, Martin Luther King Day Celebration, Baltimore City 4-H Youth Expo, and the 4-H Residential Camp Program reached 3,000 youth in Baltimore City and three surrounding counties. Youth and adults also partnered to facilitate workshops at local and national conferences. These efforts resulted in reaching 2,000 participants. Pre and post- test, demonstration, observation, reflection methods, and the logic model were used to evaluate the impact of the program. From 2005-2006 youth and adult Teen Corps volunteers trained by the Educator reached almost 4,800 (4,700 in 2005, 3,000 in 2004; 2,700 in 2005) participants

b. Impacts. As a result of teaching, mentoring and training conducted by the Educator and community partners, the following are outcomes of the Baltimore City 4-H Teen Corps Leadership Model from 1999-2006:

A logic model framework was co-authored by the Educator to describe the strategic planning of the BFP-Teen Corps and measure program outcomes.

The Baltimore Full Partners-Baltimore City 4-H Teen Corps Leadership Guide was completed by the Educator and community partners and administered to forty youth and thirty adults of Teen Corps. The Leadership Guide focused on personal development, community organizing, service-learning, environmental science and entrepreneurship. Of the forty youth that completed the Leadership Guide from 1999-2003, 81 percent report that they increased skills and knowledge of community youth and development and leadership components through Teen Corps activities as leaders and mentors. Of the seventy Teen Corps members trained through the Leadership Guide, twenty youth and twenty-two adults partnered to implement and manage 12 sustainable 4-H clubs/ programs in Baltimore City and one in Baltimore County. The youth and adults that received training from the Leadership Guide taught those skills to one hundred and twenty youth at the 12 sites. As a result, 150 entrepreneurship activities were implemented, and youth and adults partnered to teach leadership development to 10 community groups and implemented 50 on-going community activities over a three-year period.

- Thirty youth and thirty adult Teen Corps members developed and implemented the first and largest Baltimore City National Safe Night USA (a crime and violence prevention program) involving 200 youth in 1999 and 210 in 2000. The program received media coverage from Maryland Public Television, and Channel 2 News.
- Twenty youth partnered with thirty adult Teen Corps members to teach skills such as conflict resolution, team building, resume writing, public speaking, community organizing, and events planning at monthly Teen Corps meeting from 1999-2003, reaching 800 participants over a three year period.
- Fifteen youth partnered with adult Teen Corps members to implement the Baltimore City 4-H Youth Expo (a city-wide event that showcases the talents and skills of children and youth from 4-H and 100 other after school programs across the city) reaching approximately 3,000 participants in 2001, 2003, 2004, 2005, and 2006
- Three youth and adult teen Corps members partnered to facilitate the local conversation of the National Conversation on Youth Development in the 21st Century. Baltimore City had the second largest attendance from across the state. Some of the issues identified were education, employment and community revitalization efforts. Many of the Baltimore City 4-H programs and activities have been developed to address those issues.
- Twenty youth and twenty adult Teen Corps members were trained in the Mini-Society and *Learn and Earn for Fun and Profit* curriculum, in order to prepare them for the 2000 Entrepreneurship Residential Camp Program. As a result, forty volunteer staff assisted in the design and implementation of the camp program, involving 256 camp participants.
- From 1999-2002, thirty adult AmeriCorps volunteers contributed more than 34,000 hours of service to the Baltimore City 4-H Youth Development Program. All members received Maryland Cooperative Extension Volunteer Policy Training and training outlined by the National Corporation for Service.

In 2005-06, the following outcomes were achieved by Teen Corps members; reaching almost 4,800 participants:

- Environmental science projects were implemented in four Baltimore City communities. Two were community gardens, one butterfly garden, and a water barrel project
- Entrepreneurship projects were implemented at six existing 4-H sites in Baltimore City communities. One youth and this Educator co-facilitated the “*Be the E*” Entrepreneurship training to Extension Educators, and community volunteers from Baltimore City, Somerset, Baltimore, and Charles Counties. The “*Be the E*” Entrepreneurship was piloted at the Learning Inc Creative Minds after school program.
- Service-Learning projects were implemented in three Baltimore City communities. They were an Angel Tree project, National Night Out, and National Service Day. The Baltimore City 4-H Youth Expo, which showcases of talents of Baltimore City youth, was also implemented.
- Thirty youth and 16 adult Teen Corps members participated in the Baltimore City 4-H Leadership Development Program. Eighty percent of them reached the medium outcome of demonstrating skills learned in leadership, service-learning, entrepreneurship, and environmental science by implementing sustainable activities throughout the city. Evaluation methods used were observation, journaling, discussion, and data collection.

c. Source of Funding: Smith-Lever 3b&c, state general funds and various grants.

d. Scope of Impact: Multi-State

Project 5.3.3. Teen Ambassador Program—2003-2006

a. Project Statement. To establish and expand a National 4-H Shooting Sports Teen Ambassador Program that is replicable at the Regional, State and county levels, affording teens the opportunities to demonstrate their skills in leadership, citizenship and community service through ambassador activities that promote and encourage the 4-H Shooting Sports Program

After directing a focus group of teens, adults volunteers and Extension Faculty at the National 4-H Match in Raton NM (7/03), educator researched similar teen ambassador programs in 6 states and developed guidelines and application for the National 4-H Shooting Sports Teen Ambassador program. The National Committee adopted these guidelines in December 2003 for implementation in 2004. Educator provided leadership for implementing the program in June 2004 in Columbia Missouri. Some of the training topics include: Public Speaking, Etiquette, Kids n’Guns, Life Skills Development, Dress for Success, Your First Impression, Preparing Radio Spots, Leadership Development and more.

b. Impacts. Eight teens from six states were selected to participate in the second year training sessions and to represent the National 4-H Shooting Sports program in 2005-06. These teen ambassadors have now been attending various industry and trade shows

representing the program and working with Foundation representatives to gain additional program sponsor/ donors. These teens are demonstrating the program outcomes of 4-H shooting sports using life skills learned through the program. States are benefiting from having sent teens to this training. Educator is continuing to further develop the training curriculum for the National 4-H Shooting Sports Teen Ambassador program. 2006 was the second year of this selection and training program. Eight new teens from 6 states participated in the 5 day training and were selected to serve as National 4-H Shooting Sports Teen Ambassadors. (2003-2006).

c. Source of Funding: Smith-Lever 3b&c, state general funds, and grant funds.

d. Scope of Impact: Multi-State

Project 5.3.4. Environmental Science and Outdoor Education for Youth

a. Project Statement. Journey through the fields, forests, wetlands and urban areas to discover the wonders and mysteries of Maryland's natural environment. Through their 4-H environmental and outdoor education projects young people learn about the interconnection of people and nature. They also develop respect and appreciation for and a sense of stewardship toward our natural resources. This 4-H programming area provides educational opportunities that help young people enjoy time outdoors and develop an understanding and appreciation of the environment through three core theme areas; basic science and ecology, interrelationships and impacts, and health, wellness and positive outdoor experiences.

b. Impacts. During the summer of 2006, 25 camping programs were operated by 14 County 4-H Programs for 2,115 youth.

All Maryland 4-H Camping Programs were visited this year for review of over 350 standards in risk management, program development, and human resources. The reviews resulted in the camping programs continuation of accreditation by the American Camp Association for the next three years.

Fifty two youth entered 162 exhibits within the Environmental Science Department at the Maryland State Fair. This is an 18% increase from previous years.

Twenty-eight youth had the opportunity to represent Maryland at their respective national competitive events. Of these teams, the Horticulture team placed 1st overall in the National Junior Horticulture Association Contest; for the 3rd consecutive year.

Administrators within the Maryland Cooperative Extension Program made 28 visits to 4-H youth camping program. Twenty-four of these visits were followed up with an Essential Elements within the Camp Setting Evaluation. These evaluations were utilized to determine the existence of the eight essential elements within the Maryland 4-H Camping Program.

The Maryland 4-H Youth Development Program was selected by the National Military Families Association to host an Operation Purple Camp at the Patuxent River 4-H

Center. This residential camping program was specifically designed for fifty youth whose parents were deployed or will be deployed within the next several months.

Eight County 4-H Camping Programs participated in the National Camp Research Project. Campers either completed a camping context questionnaire based on the eight essential elements of youth development or a life skill questionnaire.

During the summer of 2006, 871 youth and adult volunteers donated over 51,389 hours to the Maryland 4-H Camping Program.

Using the Independent Sector's value of \$18.04 for a volunteer's time, this donation of time and energy by volunteers is worth \$927,057.56.

Each of these volunteers received over 24 hours of training, in addition to their MCE Volunteer training. This training included topics on: youth development, group dynamics, leadership, program planning, and risk management.

Eight MCE Volunteers served as middle managers for Maryland 4-H Environmental Science Competitions and coaches/chaperons on their respective National trips.

A State Camp In-Service was held for 35 extension faculty members and camp administrators. Topics included American Camp Association Standards, Department of Health and Mental Hygiene Regulations, Operating Policies and Procedures.

Two state-wide camp staff training sessions were conducted in the spring for over 120 adult and youth volunteers. Over 37 educational workshops were offered during these weekend workshops.

Two MCE volunteers and two MCE faculty members submitted proposals and presented sessions at the National American Camp Association Meeting. These proposals were referred and highlighted Maryland 4-H Camping Programs.

A Creative Camping Conference consisting of four one hour sessions was conducted at the Maryland 4-H Volunteer Forum. These sessions were attended by 120 youth and adult volunteers.

Five youth members, 15 volunteers, and five faculty members attended out-of-state camp staff training opportunities.

A team of 5 youth, 20 volunteers and 7 4-H Faculty members have joined to form the Maryland 4-H Camp Action Team. This team will help determine and direct the future of the Maryland 4-H Camping Program for the next several years.

5.4. Strengthen Skills and Knowledge to Achieve Economic Stability

(Key Themes – Estate Planning, Family Resource Management, Retirement Planning, MD Saves, Financial Security for Later life)

Family financial management is critical to achieve financial security for all consumers and families in Maryland. MCE provides research-based financial management educational programs to diverse audiences including youth, women, minorities, immigrants, self-employed individuals, farm families, first time home buyers, employees, military, childcare providers, small business owners, senior citizens, government agencies and human service providers, working poor and other limited resource individuals. Delivery methods include one-on-one counseling, fact sheets, newsletters, conferences, workshops, Internet programs, and more.

Maryland Cooperative Extension educators developed over 350 programs, resulting in 612 presentations, which were held in 23 counties, Baltimore City, all regions in Maryland, statewide, multi-state, and national. Topics covered were basic money management, credit use, insurance coverage, estate and retirement planning, savings and investments. These programs reached almost 12,000 people. For example, in our most urban areas, MCE provided training in financial counseling to social service caseworkers that work with financially troubled families. This program has multiplied and continues to reach 1,000's of low-income individuals and families in Baltimore City, Baltimore County, Prince George's County, and Howard County.

Examples of educational programs include the following:

Project 5.4.1. Maryland Cooperative Extension Personal Finance Seminar for Professionals

a. Project Statement. Financial educators and counselors have an increasing need to keep current with an ever- changing body of knowledge. Since 1989, Maryland has offered an annual financial education seminar to meet the needs of educators in the employment of the financial industry, Land Grant Universities and the military. Ten hours of general sessions were presented by nationally recognized authors. Fifteen concurrent sessions were held to meet the needs of military personnel as well as the university and industry representatives

b. Impacts. Evaluation from the 3 day seminar attended by almost 200 participants indicated that the participants felt presentations were excellent (4.4-4.1 on a 5-point positive Likert Scale). They “learned a great deal” (4.4 to 4.1), and felt it was “very useful in my work” (4.4 to 4.2). Participants rated the seminar at 4.5 in "well worth my time to attend. Participants reported that they counseled or educated in excess of 50,000 clients/families per year. Overall, MCE increased the number of Maryland consumers who enhanced their financial literacy and money management skills, managed credit better and reduced debts, participated in savings plans and increased savings/investments, plan for a secure retirement and later life issues (e.g., estate planning, long-term care). MCE enhanced the capacity of local educators, financial counselors, and human service providers to deliver personal finance education programs to help their clients.

c. Source of Funding: Smith Lever 3b&c and state general funds. This program is partially self-funded through registration fees.

d. Scope of Impact: National. Participants come from U.S. military, credit unions, housing non-profits, housing management agencies, financial institutions, five State Cooperative Extension/LGU's, and credit counseling non-profits.

Project 5.4.2. Money Management Programs – A County Example

a. Project Statement. Money management programs were attended by over 11,000 county residents between 1999-2006. Classes were presented both day and evening for the general public, farm families, day care providers, business and industry, agency employees and local governments. Hard to reach audiences were targeted through programs in community housing developments, welfare to work training programs and Head Start programs. The financial education program focuses on the areas of Financial Stability and Financial Security.

b. Impacts.

Basic Money Management:

Maryland Saves is a state wide effort to encourage Maryland families to build wealth not debt. These workshops have been offered to the Latino community, bankers, community development groups, faith based organizations and non-profits. One hundred thirty-one (131) Over 250 Maryland savers have pledged to save. Each saver identified a specific goal for saving and receives 4 newsletters a year to encourage them to reach their goal

- *Prescription for Financial Wellness* and *Financially Fit* were the two curriculums used to teach classes for over 3,000 individuals in *Basic Money Management*. Partnerships were formed with the Department of Defense, community churches, and the Anne Arundel County Board of Education to publicize the classes and provide classroom facilities and coordination of follow-up results. The curriculums have provided a comprehensive money management program and have helped participants identify money management problems before they become unmanageable.

Power Pay computer analysis was completed by almost 400 class participants (1999-2006). This analysis tool allows families to evaluate different options for repaying debt. Each family specifies how much beyond the required minimum they would like to pay towards debt. The program generates a print out that shows the saving that can be realized. The average savings, for consumers that complete the proposed debt repayment schedule is \$1,437.

Decreasing debt of increasing saving by \$2000 is the goal of *Money 2000*. Classes were taught for 200 participants.

Income instability was the common bond for 247 participants of 16 classes on *Money Transitions*. Families experiencing job loss, re-entry into the workforce and disability, learned how to develop spending plans and maximize resources. Pre-Post tests revealed that 64% had no emergency funds and did not know how to construct a spending plan prior to the program. Average expected family income was under 19,000 for 75% of participants. Post tests showed that 47% planned to track expenses and 84% identified lack of savings as they biggest financial concern.

Credit

Over 90 classes with over 2,600 participants resulted from Credit classes offered to the general public in FY99-06.

These classes included mandatory credit management classes targeted for employees who were in danger of possible job loss due to credit management impacting their security clearances. Families experiencing financial difficulty were also reached in cooperation with the following community partners: YWCA Workforce Preparation Program, Sarah's House (homeless shelter), Military Family Service Centers, Anne Arundel County Public Housing Authority, Department of Social Service Family Centers and Habitat for Humanity.

The military community has been reached with numerous classes involving over 400 Army and Navy personnel. Company commands at the Naval Station and Battalion commands at Fort Meade have ranked the Credit Survival Class as the most frequently requested and highly rated program offered. Random follow-up evaluations reported:

- 72% saved money on the next credit purchase after the class
- 43% analyzed their debt situation
- 5% negotiated new credit terms

Estate Planning

FY 99-06 *Estate Planning* seminar and classes have been conducted reaching 1,600 participants through 38 sessions. Follow-up evaluation (N=140) revealed that 84% of those sampled determined their net worth, 72% have organized their financial papers, and 12% who never had a will wrote a will as a result of the class.

Estate planning issues have been presented for seven consecutive years to the Anne Arundel County Board of Education Pre-Retiree's Seminar. Over 1,100 employees contemplating retirement have participated in the two hour sessions that are part of a one day program

Thirty-nine Department on Aging Volunteers have completed a training session on living wills and durable medical powers of attorney. As a result of the training, they have provided this information to additional limited income and isolated seniors.

Financial Counseling

Financial Counselor Trainings were attended by almost 600 participants from 1999-2006 who completed the 18 hour training. One of the programs was a team effort with Baltimore City. Trainings were attended primarily by agency or nonprofit personnel and included credit union counselors, financial aid officers, habitat for humanity volunteers, Head Start staff and Department of Defense employees. Participants (n=108) who have used the information within their agencies have provided assistance to 1,061 families in financial difficulty.

Retirement

FY 2005 Coordinated with the Maryland State Supplemental Retirement Program and six Extension Educators to develop and present 27 seminars reaching a total of 1,083 participants. Hamilton taught 4 of the seminars with participation of 118. The classes were 1 ½ hours in length and were the kick off presentation for a day long program on retirement. Total seminar evaluation rated *Your Financial Check-Up* as the highest ranked segment by over 90% of the participants. Classes have been requested again for the 2006 schedule.

Thirty-seven retirement planning programs were developed and taught to meet the needs of a variety of audiences during FY 99-05. Targeted audiences included day care providers, pre-retirement employees, recent retirees, federal workers with more than 5 years to retirement, campus personnel and Extension colleagues. Classes were attended by 2,309 participants. Evaluations revealed (n=71)

- 82% identified retirement goals
- 35% estimated the amount to save
- 28% increased retirement saving, 11% started a retirement saving plan

Saving Today for Tomorrow, was presented twice for service workers with low wages. Forty-six individuals participated in the classes which focused on strategies for saving the Earned Income Credit that they would receive from their tax return. As a result of the class, 5 individuals opened their first Individual Retirement Account and 6 participants began savings bonds through payroll deduction.

Do You Want to Work Forever was presented for self employed audiences including, nurserymen, farm families, day care providers and new business owners and was translated for Spanish landscapers at the Green Industry Conference.

Nurserymen and daycare providers share similar challenges in retirement saving options. Two classes on *Retirement Planning for Small Business Owners* were planned to meet the needs of these audiences.

c. Source of Funding: Smith-Lever3b&c and state extension funds.

d. Scope of Impact: State-wide programming.

5.5. Develop and Accept Individual, Parental, Home, Financial, and/or Community Responsibility Through Work, Family and Community Involvement

(Key Theme – Child Care/Dependent Care, Parenting, Grandparents as Parents)

Maryland Cooperative Extension educators developed over 200 educational programs resulting in 300 presentations, which were held in 23 counties, Baltimore City, three regions in Maryland, statewide, multi-state, and national. Topics covered were care giving, understanding children and their development, modeling appropriate behavior, nurturing family members, advocating for families. These programs reached over 24,000 people.

In 2006, Maryland Cooperative Extension (MCE) continued the development of a new website to the community of professionals and families on child care and afterschool issues. A click on www.mcecares.org takes the user to the MCE Child Care and After School Program web site. This site features the programs MCE's 4H Youth Development and Family and Consumer Sciences Program Areas offer to enhance the quality of child care and afterschool programming through training for its professional, educational on-site programs for children and youth, and resources for families to find quality care.

For more than a decade, Maryland Cooperative Extension has provided continuing education training for child care providers across the state. MCE offers training on topics across the Core of Knowledge (Maryland Department of Human Resources, Child Care Administration) to help professionals who work in child care centers and family child care homes maintain their registration and licenses. Training locations, events and times vary depending on the jurisdiction.

Through the 4-H Youth Development program we offer programs for elementary and middle school age children in afterschool sites. 4-H clubs can be organized through an afterschool program. Also, specific short-term educational programs such as "*Reading Buddies*" and "*Entrepreneurship*" can enhance afterschool programs. Our 4-H effort is part of the national USDA 4-H Afterschool Initiative.

The MCE Child Care and Afterschool Program website also benefits professional and families as a consortium of information about Maryland specific child care research and program evaluation, and professional education opportunities. This website is intended to be a one-stop location to learn about what's happening in child care in our state. Our goal is to enhance the quality of care for children and youth by

- Bringing together the resources of our agency's program areas and making them available to the professional community.
- Coordinating information about child care and afterschool program, research and funding activity in Maryland to support professionals who work with children, youth and families.

Examples of educational programs include the following:

Project 5.5.1. Parent and Family Development

a. Project Statement. Effective, stress free parenting and the need for quality child care are two basic issues facing Maryland families. Maryland Cooperative Extension is dealing with these issues through participation in a new system of online education and information (eXtension), training to child care professionals (a practice known to increase the quality of care), the provision of quality after school programs for school age youth, and providing resources and education to human service professionals and others who serve as parent educators. This past year MCE Specialists working in the area of Family Life and Child Development conducted research, developed educational and outreach resources, supported Extension county staff in outreach efforts, and participated in state and national Extension and related field activities.

b. Impacts. The summer 2006 early childhood conference at UM was rated favorably by a majority of attendees, with 35 attendees receiving CEUs from the university, and paving the way for additional partnerships between MCE/Family Studies, UM, the Maryland State Department of Education, the Montgomery County Department of Health and Human Services and the Montgomery County Collaboration Council.

The eXtension CoP has produced and reviewed a 12 part series of newsletters to be launched in spring of 2007, with a complete FAQ and Ask the Expert system and instruments for the collection of evaluation information. The model is in place for additional materials to be developed in this and coming years to make information available for ages 2 through 18. The evaluation work has been cited by the eXtension leadership team as a model for other CoPs.

The database of teaching ideas using film and television is now searchable and has been posted on the internet. Funding is sought to enhance and expand the site and database. Conference sessions to over 100 participants were rated as very good or excellent by over 90%. At the CYFAR conference, the workshop was written in as one of the most engaging and interesting of the conference.

Results of a comparative study looking at the use of a popular film to teach relational aggression, determined that undergraduate classes using the film performed as well as a class that did not use the film. Those in the class who particularly benefited were those students without prior history or experience with the antisocial behavior being displayed.

Afterschool evaluation materials created for the three CYFAR funded afterschool sites yielded the collection of participation data in format easily adapted to required year end reporting. Information collected from sites about their program contributions to the 4H Essential Elements of effective youth programming is creating a statewide document of shared and individual process features. This document is expected to be shared nationally, perhaps as a model for other afterschool and 4H programs.

Project 5.5.2. Maryland Cooperative Extension Child Care Provider Training

a. Project Statement. Regulated childcare providers in Maryland are required to have continuing education hours in health and safety and child development and curriculum to maintain their licensure. These hours are reviewed every year and must come from approved trainers in the state. Maryland Cooperative Extension has been an approved trainer since 1994. Family childcare providers and child care center directors and teaching staff is the primary audience for MCE's training. Others who attend include parents; Head Start and public school teachers and unregulated child care providers. Training covers topics in child development, curriculum, health and safety, business management and topics of professional development (such as stress management). Topics are offered at beginning, intermediate or advanced levels of professional development, depending on the needs of the audience. MCE frequently partners with other child care/early childhood groups to conduct training, thereby broadening our reach and enhancing the quality of our programs.

b. Impacts. Child care professionals continue to be reached through continuing education efforts through Cooperative Extension. Each year at least 1000 providers receive workshop training through specialist and county educator efforts, alone and in collaboration with local, state and regional agencies. In 2007 MCE is expected to secure a key position in the state providing emergency preparedness training (mandatory) to child care professionals statewide. This is being done through collaboration with Penn State University, and the Maryland State Dept. of Education (Office of Child Care). The topics of childhood obesity prevention through child care, and outreach to Latino families are also expected to be key to our work through MCE. Collaborations with Georgetown University and Centro Familia are being investigated.

c. Source of Funding: Smith Lever 3b&c, and state general funds.

d. Scope of Impact – State of Maryland. Collaborators include Child Care Administration, Maryland Committee for Children, and local childcare resource and referral and professional child care associations.

Project 5.5.3. 4-H After-School Initiative

a. Project Statement. While most Maryland children, 62%, spend some portion of the hours after school in the care of a parent or guardian, 25% of Maryland's K-12 youth are responsible for taking care of themselves. These children spend an average of 7 hours per week unsupervised after school.* More than 25% of the K-12 youth in self-care would be likely to participate in an afterschool program if one were available in the community.* Similarly, 27% of all children not in afterschool would be likely to participate if an afterschool program were available in the community, regardless of their current care arrangement. Source: America After 3 PM household survey, *Afterschool Alliance, with support from the JC Penney Afterschool Fund*

4-H Afterschool Initiatives supports the three core focus areas of Maryland 4-H – Strengthening and Expanding 4-H Clubs, Providing Training and Support for Volunteers, and Outreach to Underserved Audiences and is an important delivery method for achieving the goals of the Maryland 4-H Strategic Plan.

Program Development:

Maryland 4-H youth development has launched a 4-H Afterschool initiative as a part of a national 4-H effort to provide extraordinary learning opportunities to school age youth in urban, suburban, and rural communities. Currently, 4-H youth development educators provide quality curriculum resources and professional development training for afterschool staff. 4-H youth development educators and adult and teen volunteers partner with community afterschool programs to organize 4-H clubs that provide youth positive interaction with caring adults, hands-on learning for life skill development, and service opportunities to make a difference in their communities. In 2006 a needs assessment survey was implemented to identify current afterschool programming and needs for program support. From this survey, training for 4-H educators and staff was developed with a primary focus on integrating 4-H curriculum in to existing

community-based afterschool programs. A state wide training took place in February 2007.

b. Impacts.

- Statewide, approximately 33,386 youth are participating in 4-H afterschool programs
- MCE Cares Web Site (www.mcecares.org) offers access to training, programs resources and information, research and a calendar of MCE programs for Maryland's child care and afterschool providers and serves as a vehicle for internal communications among MCE 4-H and FCS educators.
- Youth in Somerset, Garrett, and Frederick counties are building technology skills through participation in community-based 4-H computer labs, funded by CYFAR New Communities Project.
- Garrett county 4-H afterschool partnerships with 21st Century Community Learning Centers have expanded the number of days that afterschool centers are open in four rural communities. The afterschool initiatives are funded by CYFAR New Communities Project. 4-H curriculum has been employed in the development of lesson plans that focus on agriculture, environment, communication skills, and healthy lifestyles.
- Talbot, Dorchester and Calvert county 4-H youth and adult partnership teams build literacy skills of elementary youth through afterschool and out school time Reading Buddies programs using 4-H curriculum as a base for programming.
- In Anne Arundel county and Baltimore city, youth in afterschool programs build entrepreneurship, business, and civic skills through 4-H.

c. Source of Funding: Smith-Lever 3b&c and state general funds.

d. Scope of Impact: Multi-county

Project 5.5.4. 4-H After School – A County Example

a. Project Statement. School-aged youth need access to a safe, structured and nurturing environment during non-school hours when they are most likely to engage in risky behaviors. The Garrett County Comprehensive After-School Opportunity Plan identified lack of after-school programs, especially in remote areas of the county, as a pressing need. County rates of Child Poverty, Adolescent Substance Use and High School Dropouts are higher than State rates, indicating that youth in Garrett County are at risk for sub-optimal life outcomes. A recent local needs assessment indicates that elementary school youth are at risk due to lack of commitment to school and low academic achievement.

The After-school Extension Project will bring Extension staff into partnership with many other youth-serving organizations as part of a coordinated after-school effort. The CYFAR New Communities Project in Garrett County will bring the resources of MCE into the new system of after-school programs. The resources made available include use of an outdoor education center, computer lab, life skills curricula, and the expertise of the 4-H Youth Development educator and program assistant. After-school youth will

benefit from a variety of experiential education sessions including outdoor programming agriculture education with farm tours, and experiential education.

b. Impacts.

- Garrett County proposal was funded as part of the Maryland CYFAR New communities Project funded by USDA
- After-school coordinator joined 4-H staff
- 180 youth have enrolled in 4-H through the after-school program
- Partnerships formed with the Board of Education, the Partnership for Children and Families, Health Department, and Community Action Committee
- Extension staff offered contract to provide training for after-school staff.
- Lights On After-school event hosted at Western Maryland 4-H Center with media politicians, and educators attending.

c. Source of Funding: Smith-Lever 3b&c&d and state general funds.

d. Scope of Impact: Multi-county and State-wide

Project 5.5.5. 4-H After School – Building Wonder in Math and Science

a. Project Statement. Six counties and Baltimore City worked with 35 teen leaders and 35 adult volunteers to engage 398 youth (15 elementary, 364 middle school, and 19 high school) in experiential learning, to improve their understanding of scientific concepts and to develop their skills of scientific reasoning and decision-making.

The *Wonderwise* curriculum was taught to underrepresented youth in after-school programs, summer camps, and recurring weekend programs. The program reached a diverse audience of youth: 57% African American, 32% Caucasian, 4% Asian, 3% Hispanic, and 4% of youth from other racial backgrounds.

The State 4-H Afterschool Team supported the local sites initially with a distance education training on the curriculum, evaluation pieces, and working with teens in after-school settings.

b. Impacts. The *Wonderwise* program in Maryland used several of the *Wonderwise* modules to achieve the program objectives. All objectives were achieved. Some of the highlights of the findings include:

- Approximately 90% of the participants learned the following scientific words and could accurately explain or discuss the concepts: ecologist, surface tension, herbivore, urban, botanist, hypothesis, biodiversity, food web, carnivore, rural, hydrologist, transect, habitat, watershed, wetland, seed dispersal, entomologist, and erosion.
- Youth learned about investigation, performing measurements and calculations, writing a hypothesis, performing the research, and then finding the answer to questions. Youth developed a basic background in photosynthesis and made the

connection that the starch in plants and other foods are complex carbohydrates that provide energy.

- Youth planned and conducted an investigation, learned to estimate, measure and interpreted data, and developed an understanding of biodiversity and of form and function.
- Youth learned about the scientific method – how to pose a question, make a hypothesis, test the hypothesis, gather results and information, and reach a conclusion.

Several of the sites have identified an interest in continuing the program in after-school sites. Through a survey, 85% of these teachers stated that they would “definitely” utilize the activities presented by the teens in their classrooms. Additional funding will be sought to expand this

c. Source of Funding: Smith-Lever 3b&c&d and state general funds.

d. Scope of Impact: Multi-county and State-wide

5.5. Enhance the Attractiveness of Maryland Youth to Potential Employers to Enable Youth to be Productive, Contributing Members of a Global Society; Increase the Ability of Maryland Youth to Have Caring Relationships with Family Members, Peers, and Others in Their Communities; Increase the Abilities of Maryland Youth to be Competent Youth Leaders with a Strong Commitment to Civic and Social Responsibility; Strengthen Maryland Youth’s Understanding of the Importance of Good Health and Safe and Healthy Lifestyles.

Maryland Cooperative Extension educators developed over 1,000 programs resulting in over 2,500 presentations, that were held in all 23 counties, Baltimore City, all three regions in Maryland, statewide, multi-state, and national. Topics covered were enabling youth to be productive, contributing members of a global society; have caring relationships with family members, peers and others; competent youth leaders with a strong commitment to civic and social responsibility; and understanding of the importance of good health and safe and healthy lifestyles. These programs reached over 100,000 people.

Examples of educational programs include the following:

(Key Themes – Children, Youth, Positive Youth Development, and Families at Risk)

Project 5.6.1. Adventure in Science, Baltimore City

a. Project Statement. Adventure in Science, a six-week program held twice a year, is designed to encourage city youth to take more of an interest in science, technology, and math, augment science, technology, and math in school, and to highlight careers in science, math and technology. According to the Maryland Higher Education Commission, economic and educational disadvantages as well as the student’s expectation that math and science are subjects in which they cannot excel based on past experiences creates a fear of math and science avoidance. Educators coordinated the program with the assistance of volunteers from the faculty of Coppin State University and the University of Maryland- School of Nursing.

b. Impacts. Seventy youth ages 8-13 participated in the program along with twenty of their parents. Volunteers with expertise in these subject areas, facilitated lessons to small groups, using hands-on experiments. Volunteers also shared information about their professions. At the end of the lesson, each youth shared what he/she learned in their particular session with the larger group and also completed an end of class reaction form. Ninety percent of the students gained knowledge about the topic they studied in their session; Seventy-five percent became more excited and interested in science, math and technology; and fifty percent expressed a desire to pursue careers in science, math or technology.

c. Source of Funding: Smith-lever 3b&c and state general funds.

d. Scope of Impact: Multi-County.

Project 5.6.2. Adventure in Science, Montgomery County

a. Project Statement. In 1990 a retired NASA scientist, who founded the program in 1973 and a few founders approached the Montgomery County 4-H staff to help them expand on their hands-on science program for children. The goal was to supplement school science instruction and to inspire young students with hands-on science and technology educational programs and to introduce them in science related careers. A partnership of 4-H, scientists and other professionals formed and the 4-H Adventure In Science Program was launched. The 4-H Extension Educator became the 4-H representative, overseeing the management, administrative and educational needs of the program.

The 4-H Adventure in Science (AIS) Program is a hands-on scientific program for youth, ages 8-14. AIS participants are enrolled as 4-H members and are entitled to participate in all 4-H programs and activities. AIS operates at four sites: the National Institute of Standards and Technology (NIST) the National Institutes of Health (NIH) Lockheed-Martin Corporation and Comsat Corporation in Germantown, MD. AIS members meet for 18 Saturdays from October to March, for three hours of hands-on science experimentation with 25-50 youth meeting at each site. Sessions are designed to be very informative, interactive and inspiring.

4-H AIS participants must register and pay a minimal fee for registration and to offset the Adventure In Science program expenses. Special consideration is given if a family has more than one participating child. The program also provides a scholarship if a child is in need of financial support to participate the AIS program.

An AIS Board of Directors meets regularly to oversee and govern the program. The board and the site managers allocate the financial resources and educational materials and supplies needed by the sites. All materials and technology needed for the Parents' Day presentations are managed by the AIS Board of Directors and site managers.

Each site operates with its own site managers that plan and execute classes in brain functions, dissection, rocket models, engines and robotics and as well as planning the

educational materials and supplies for hands-on activities as needed by the students and volunteer teachers.

The classrooms and laboratories for AIS programs are generously provided by the four sites mentioned above.

The AIS sites are managed by two site managers in each location. Site managers collaborate with each location to secure classrooms and labs, recruit parents and other scientist from their organization to conduct the classes. Parents are required to devote a minimum of 15 hours to teach or assist in other activities. Site managers schedule and manage the weekly sessions and volunteer teachers. They manage any field trips and rocket launches. They work hand in hand with the 4-H Educator to make sure all registration and administrative work is in place.

The 4-H Educator oversees all administrative, awards, educational needs of the program, and arranges the monthly meetings and training, recruits teachers from the university and other organizations.

b. Impacts. Program participants come from different parts of the Montgomery County and neighboring counties. Annually about 3000 hours are contributed by volunteers and site managers to conduct the AIS program. In the past 15 years more that 3000 4-H youth have participated in the AIS program.

Changes in knowledge and skills are measured, via observation, verbal feedback and post tests by youth and adults.

- Individuals gained awareness of 4-H programming
- Gained skills in working with adults and peers
- Students understand the experiential learning and application process
- Increased awareness of different concepts of scientific and environmental issues
- Are able to work on a project of their interest and chosen topics.
- Presented formal reports (scientific research and findings) and displays to parents and other viewers at the Parent' Day event.
- Students made many good friends
- Students became more resourceful and interested in the science field.

Changes in Behavior are measured based on observation, verbal feedback and post tests conducted by youth and adults.

- According to the AIS registration data, of the registered youth 90 percent youth attended all classes
- Out of Approximately 200 registrants, 130-160 youth presented their scientific findings at the annual
- Project Presentation Day attended by parents and other viewers.
- Individuals developed knowledge and skills to learn and implement projects accordingly
- Students learned responsibility and commitment to the program
- Students participated in other state and national scientific events
- Parents worked with site managers to keep older youth involved in leadership roles

- Parents are more encouraged to take part in teaching, and also recruit others to participate
- Students indicated that they learned many new things and positive instructions as a result of the AIS Program.

Impacts documented based on verbal feedback, observations and post evaluation gathered from youth and adults.

- Most participants returned and encouraged their friends to participate. About 65 percent returned to the program
- Older youth stay in the program and returned as teen teachers and volunteers
- Teens often choose scientific areas of interest after graduating from high school. Some of them are given an opportunity to be an intern in one of the sites.
- Approximately 10 percent of the AIS students joined the traditional 4-H clubs and 15 percent participate in other 4-H events and activities
- Individuals increased awareness of different types of 4-H programs
- AIS students recruited more youth to join the AIS program
- Parents are more involved and are willing to help every year. Some returned to help teaching even after their children are out of AIS program. There is a great sense of collaboration and commitment to the program.
- Older AIS youth are matched with mentors to explore and identify advanced research projects and future career opportunities. About 15 youth go through this process each year.

This program reaches many youth with specific interests in science and technology. As Montgomery County is becoming more urbanized and diverse, there is a greater need to provide more programs that reach more diverse audiences to participate in the 4-H Science and Technology programs. The goal of this program is to present science as an exciting activity and a way to thinking about the world rather than as a compendium of facts. The topics presented in the program reflect the interests of the children and the volunteers.

Initially this program attracted a high percentage of Asian families. In the past years there has been a growing interest and participation by Hispanic, White and African American audiences. This model has also been replicated in other parts of Maryland and in Michigan. The program is conducted for 18 Saturdays; However, the parents seemed to be more supportive to the program regardless of the length of time. Parents and their children appeared to enjoy the many other educational 4-H activities. This is a great way of reaching youth and families who otherwise will not have chance to know what can be offered by 4-H.

Project 5.6.3. 4-H Animal Science Program

a. Project Statement. Maryland Animal Science program (Clover Ages 5-7 and Ages 8-18) reaches almost 9,000 youth statewide. The Maryland 4-H program has various activities (Judging Contests, Bowls, Skillathons, Jamborees, Carcass Contest, and Livestock Shows) throughout the year to capture these individuals to expand their knowledge in age appropriate and experiential events. These statewide events attracted over 2,000 individuals (23.0% of state's animal science enrollment) to participate.

These activities follow the youth development model. From each of the events, youth are more attractive to potential employers and are more likely to be productive members of a global society. Participants learn subject matter materials beyond what is learned in their appropriate curriculum to better prepare them in the field of animal sciences. Secondly, youth have more caring relationships with family members and peers due to the family nature of animal science events. This is evident with the caring and family-oriented projects that they complete. Since many of the animal project areas require adult and family assistance, these projects allow for family participation. Furthermore, these projects require daily care and attention. In addition, many of these events are setup as teams. Individuals must learn to work and communicate with one another.

b. Impacts. Youth from the animal sciences are increasing their abilities to be competent leaders. This is evident through the judging programs that the youth participate. In these activities, youth form decisions by utilizing critical and analytical thinking then defend their decisions in an oral defense. With this exercise, youth are learning many life skills. Lastly, youth are learning the importance of safe and healthy lifestyles. They are accomplishing this by learning proper nutrition of their animal that are in their care. In addition, they are learning how to do so in a safe and wholesome manner. With participating in events such as judging, bowls, Skillathons, demonstrations, public speaking events, and exhibiting animals, youth are developing life-long skills that will assist in their development whether or not they choose to enter the Animal Sciences for a career. These learned skills consist of public speaking, analytical thinking, creativity, networking, and a broader knowledge of the project that they are learning about.

c. Source of Funding: Smith-Lever 3b&c, and state general funds.

d. Scope of Impact: State-wide and collaboration with DE, VA, WVA, Penn.

5.7. Youth Development

(Key Themes –Character/Ethics Education)

Project 5.7.1. Reaching Out to at-Risk Audiences

a. Project Statement. In 2002 the Frederick City Housing Authority approached MCE to develop positive youth development activities at public housing units as part of a HOPE VI revitalization grant the city had received. During 2003, the educator applied for and received a five-year \$150,000 grant to purchase capital equipment and staff two computer center located at two different public housing unit locations (Sagner and Taney Public Housing) in Frederick

Two staffed computer labs serve youth between ages 7-12 to provide opportunities for informal instruction on computer software. Youth use the facilities for technology-based homework assignments and to learn basic computer skills and software. Between 2004-2006, there were over 100 technology-related classes taught by a faculty extension assistant supervised and trained by the 4-H Educator.

Goals of the program are to increase youth computer literacy skills; increase the use of computers for homework; and offer positive activity options for low-income, at-risk youth in these neighborhoods.

b. Impacts. At the end of year one, the Sagner and Taney computers centers have become fully operational and available for use by children in the communities. At the Sagner facility 15 youth are using the lab for homework at least twice a week. Of these children, 75% have learned to complete internet-based lessons and 50% have used the computer lab for homework at least once a week. There are about 25 additional children using the lab on a periodic drop-in basis. At the second computer site, 6-12 children are attending a weekly technology-based 4-H Club. In addition the labs have impacted children outside of the initial target areas as transportation to the lab is now being made available by request for youth from an outside community. Also, a request for program expansion to a third site has been made by the Housing Authority HOPE VI Project Director.

c. Source of Funding: Smith-Lever 3b&c&d, and state general funds

d. Scope of Impact: State-wide.

5.8. Youth Development

(Key Themes –Jobs/Employment, Workforce Preparation)

Project 5.8.1. Integrating Technology into Everyday Practices

a. Project Statement. *Integrating technology into everyday practices to maximize communication, teaching, learning, and evaluation is goal five of the current Maryland 4-H strategic plan. In Somerset County, the 4-H educator developed a computer-based after school program where youth are learning how to use technology to build their literacy skills both in reading and technology.*

The 4-H educator created, developed, established, and secured funding to initiate this program in Somerset County Maryland. Cyber Town at the Woodrow Wilson Community Center was established to provide youth with technology education and bridge the digital divide for rural youth. When the project began in 2002, the targeted youth who lived at the Crisfield Housing Authority had limited access to technology. The local school system did not have Internet connection and the local public library had only two Internet-connected computers available for public use. The project was introduced as a prevention program because concerned community members such as teachers, parents, youth, and business leaders did not want young people in their community to fall behind in our computer driven society.

To organize the after-school effort, the educator developed the Somerset County Educational Intervention Team. This team included business owners, teachers, youth, parents, community agency representatives, and Maryland Cooperative Extension (MCE) faculty and staff. The team developed plans to expose youth to technology and teach team computer skills. They believed this was the answer to “fixing” the technology gap in Crisfield. The delivery method that the team decided upon was to

establish an after-school program. This decision was based on the fact that limited after-school programming was available to community residents.

The team reviewed the research on reading to develop a concrete educational plan utilizing computers for instruction. Castellani and Jeff (2001) state, "The critical reading processes that computer technology can support include: Comprehension (annotating, linking ideas, etc.), idea generation (brainstorming), analysis (articulating and classifying positions, reacting to others' comments), reflection (using an electronic journal to develop metacognitive awareness – reflecting on topics, tasks, learning strategies, etc.), composition (writing papers), and communication (electronic mail)." Computers are successful tools in teaching reading because they provide for a high level of interactivity, which means that there is two-way communication between the user and the computer (Meyer & Rose, 2000).

The children attend the lab daily from 3:30 pm to 6:30 pm. The computer lab is open daily as an after-school program site for children to gain instruction in reading, help with homework, and assistance with research. It offers recreational options such as interactive computer games, e-pals, and basketball. The after-school location provides assistance with homework such as access to research via the Internet. The program provides extensive instruction in reading to build comprehension due to demonstrated participant need.

b. Impacts. The Cyber Town evaluation design detail several methodologies to assess program process and capacity. Student outcomes are evaluated using: 1) teacher assessment; 2) report cards; 3) attendance records; 4) GPA; 5) software assessment. The after school program is evaluated utilizing the following methods: 1) focus groups; 2) participant surveys; 3) comment cards. The capacity evaluation includes interviews with key stakeholders after school program coordinator, referral teachers and information from focus groups.

Cyber Town was evaluated using a formative evaluation using a pre-post test methodology students filled out a pre-program evaluation at the beginning of the year and then completed a post-program evaluation at the end of the program. The program impacts were evaluated through a pre and post program entry test.

The success of the after-school site's ability to increase reading comprehension was measured using a pre- and post- entry test. As each individual entered the lab they were given an age appropriate reading test. After one year of treatment the group was then given an age appropriate post reading test. Descriptive statistics reveal that the pre-test scores had a mean of 52% (SD=22) this demonstrates that the test scores had a wide variance but overall were low. The highest score that could be achieved was 100%. Overall the youth did not perform well on the pre-test. After participating in the Cyber Town after-school program, the youth were tested and mean score was 73% (SD=8). This demonstrated that the youth scored much higher on the test. Their scores were a good deal closer to the mean illustrating that more students scored nearer to the average. The percentage also showed that overall scores increased by 21%.

Participants in the Cyber Town program were reported to have less school office referrals than youth who did not attend. This data was recorded and reported by the

principal of the local elementary school. In addition to better behavior, teachers reported that youth who attended the Cyber Town after-school program turned in complete and accurate homework. The final report cards of youth who participated in the program showed a continual increase in student GPA's over the nine month grading period.

Cyber Town was accepted as a National Program of Distinction by the United State Department of Agriculture in 2005.

c. Source of Funding: Smith-Lever 3 b&c&d, state general funds and various grants.

d. Scope of Impact: Multi-County and State-wide

Part A. Planned Programs (continued)

REE Goal 6. Agriculture Communications, Enhancing Customer Service/Satisfaction Information Technologies

Project 6.1.1. UMES - Establishing a Geospatial Information Technology Training Center for Minority and Other Student Audiences

a. Project Statement. Nationwide statistics indicate that minorities need additional exposure and training in scientific technological areas as career choices. This is due to the fact that their numbers in the workforce and on university campuses STEM disciplines are small and need immediate rapid improvement. The purpose of this project is to provide an opportunity for minority and other race audiences to receive experiential learning and training in geospatial information technologies, GIS and GPS, in a campus setting at the high school and undergraduate levels. Undergraduates are provided training for eight to ten weeks on and off campus. High school interns spend two weeks on and off the UMES campus as some students commute.

b. Impacts.

High School scholars Program

Forty-four high school students completed a two-week Geo-spatial Information Technology Internship at UMES during summers (2003 to 2005). Students received intensive training in geo-spatial information technologies, Geographic Information Systems (GIS), and Global Positioning Systems (GPS). The students were grades 10-12 from various cities and high schools from Maryland, Pennsylvania, Oklahoma, Ohio and Arkansas; most of the participants were from Maryland. Interns were separated into five groups, each group was engaged in various tasks that included mapping drainage ditches using GIS and GPS, and testing soil and water samples collected in the field for nitrogen, phosphorus, sulfur, pH, and erosion. All interns were required to keep journals and develop and present scientific posters on their GIT and water quality management projects. During the first two days, interns participated in an intense Environmental Systems Research Institute (ESRI) workshop, Introduction to ArcGIS – I which was followed by a lecture and hands-on training on GPS. Training was provided by the UMES ESRI Authorized Instructor. Interns also sampled selected drainage ditches for water and soil and tested soils for sulfur in the field using a 10% solution of hydrochloric acid. Personnel from the University of Maryland College Park supervised field exercises, and technicians from UMES directed laboratory analysis of pH, nitrates, and phosphates on both water and soil samples. Water samples were further analyzed for electrical conductivity, salinity, and suspended sediments. Interns also participated in a rainfall demonstration taught by scientists from the USDA/ARS Unit at University Park, PA to learn about the effect of rainfall on soil erosion. A ten-foot pit was used where interns classified different soil strata based on texture and color differences. A major objective of these internships was to provide high school students, especially minorities, with hands-on experiences with GIT and water quality management and

provide a forum for recruitment of students into the Department of Agriculture and other disciplines.

Undergraduate scholars program

Each year, UMES also provides internships and work experience for undergraduates in geospatial information technologies. During the summer of 2003 to 2005, twelve UMES undergraduate students participated. Interns worked with local agencies, and assisted the UMES submerged aquatic vegetation (SAV) project. The internships began with an intensive two-day Environmental Systems Research Institute (ESRI) workshop, Introduction to ArcGIS - I followed by 16 hours of training in GPS. Students worked with the Somerset County Planning and Zoning where duties included updating and correcting Somerset County zones with the use of tax and road maps. Flood maps were also edited and modified for Somerset County, MD. Other activities for students included, creating data sets using ArcView software to identify the length and pavement type of Somerset county, MD roads. This included navigating and determining pavement types and measuring lengths of county roads, transferring data into ArcView for future use, and hand drawing maps of a fire district using paper maps to create updated digital district maps, creating digital file for the UMES Farm to digitize individual fields for future planning and management, and assisting the campus SAV project where GIS and GPS was used to locate areas where eelgrass (*Zostera marina*) grew, and where seed stock could be collected, collecting wrack and sediment from Assateague Island and the Isle of Wight, and separating and maintaining eelgrass seeds for germination experiments. The ten-week internship concluded with a poster presentation.

- c. **Source of Funding:** CSREES - Capacity Building grant and USDA's NWQI.
- d. **Scope of Impact:** local, regional and national.

Project 6.1.2. UMES - Geospatial Technology Academic Infrastructure Enhancement

a. Project Statement. GIS technology has grown, so has the use of our existing facility, making it very difficult to keep pace with demands from faculty, staff and students. We need a better infrastructure for our geosciences program. We offer only one 3-hour course - Principles of GIS, and certificate training of Environmental Systems Research Institute (ESRI)'s Arc View; additional courses are needed at both the graduate and undergraduate levels as our need for this tool is growing rapidly. The overall need is to secure funds to provide a newly improved campus-wide GIS Center with new hardware and software, training for students, faculty and community persons, and additional GIS undergraduate and graduate level courses to better serve our growing number of technical, and research projects. There is a tremendous increase in employers looking persons with GIS skills. This leads to the importance of introducing this technology to minority and other race students early in their careers, even in high school, which could also boost minority enrollment in the college sciences. It appears logical that we will need a larger number of highly trained professionals in the area of GIS, especially minorities due to the horrific imbalance in the existing scientific workforce. The objectives of this project are to upgrade existing academic delivery

infrastructure in GIS, (2) Develop new courses in GIS that will provide timely and convenient courseware and training for students, agencies and communities who want to improve their knowledge of this technology for job skills/job placement, and (3) Upgrade the number of faculty members at the University with GIS credentials. The establishment of a GIS center at UMES is essential since this technology is changing rapidly, new uses for GIS are evolving daily, and workforce development in GIS would benefit in the short and long time frame. This effort would assist in the preparation of new talent, especially minority talent which is needed to create more diversity in the work place. The approach will include replacing all computer hardware in existing GIS lab with new state-of-the-art equipment, and obtain required software and software licenses. Hardware that will be purchased include: 10 workstations for faculty and student use, 1 workstation for GIS Coordinator, and 1- workstation software peer server. Step 2 is to develop and offer full courses and short courses which will improve, not only curricula and materials, but infuse related subject matter and policy decisions into axially courses into the natural sciences, social sciences, humanities and other disciplines. New semester-based courses to be developed are given as follows: GIS applications in natural resources management, computer cartography, introduction to remote sensing and image interpretation, precision farming, and ARC/GIS short courses. These will be offered to the general university community, as well as, government employees seeking some level of competence in GIS in line with procedures and guidelines established for developing and sustaining Higher Education in GIS.

b. Impacts. New courses will benefit undergraduate and graduate students and interested faculty in natural sciences, agriculture, computer science and engineering & technology. These courses will service various researchers and students involved in studies with geospatial components. Release time will be provided for existing faculty to develop and prepare new curriculum materials. Some of these courses will be offered as one credit courses, or multiple courses that will be required by different disciplines. Agency collaborators will also review the courses for warranted academic content requirements and skills necessary for advanced placement within various applicable agencies. Additionally, subject matter content will demonstrate GIS technology applications such as weather tracking, spatial analysis, precision farming, policy implications and analysis of social change, monitoring of animal habitats, biotic components of environmental analysis, endangered species, host-plant resistance, nutrient management practices, urban sprawl, case histories, water resource management, and analysis of satellite images. Provision of funds for professional development activities for five or more faculty members to receive training in GIS at a Training Center in Vienna, VA and existing UMES trainers will enhance the overall expertise in GIT at the university. This will significantly upgrade the number of faculty at UMES with GIS expertise to nine. Five existing faculty members at the University have varying degrees of GIS expertise will receive additional training that will be of an advanced nature. Faculty members with limited proficiency will be identified using a GIS Needs Assessment evaluation survey. Training periods will range from 6 months to 1 year.

c. Source of Funding: CSREES- Capacity Building.

d. Scope of Impact: local, regional and national.

Part A. Planned Programs (continued)

REE Goal 7. Multicultural and Diversity Issues

Project 7.1.1 UMES – Developing an Ornamental Option for Under-Represented Students

a. Project Statement. Potential, non traditional agriculture students tend to be unaware that career opportunities in the horticulture industry are related to agriculture. This project seeks to attract these students to agriculture by developing an ornamental curriculum at UMES. Ongoing activities include a 2-week summer ornamental institute for high school students, undergraduate experiential and scholarship opportunities, and curriculum development and revision in the agriculture department.

b. Impacts. Twenty six high school students from 16 high schools on the Delmarva Peninsula and neighboring states participated in the 2005 and 2006 summer ornamental institutes. They developed awareness of the different facets of ornamental horticulture and related career opportunities. Ten undergraduate students participated in experiential and scholarship opportunities, making it possible for them to learn about ornamental horticulture and make progress towards their degree. Three experimental courses, Plant Propagation, Ornamental Plant Materials and Lawn Water management were developed and taught.

c. Source of Funding: CSREES- Capacity Building.

d. Scope of Impact: Regional, National.

Project 7.1.2 UMES-Broadening Perspectives: Educating Under-Represented Youth about Food and Agricultural Sciences Through Experiential Learning

a. Project Statement. Despite growing opportunities for college graduates in the food and agricultural sciences, enrollments in Colleges of Agriculture nationally continue to decline. Many youth think that agriculture only consists of farming. They fail to realize that agriculture encompasses a system of interdisciplinary approaches which include such areas as biotechnology, food safety, natural resource management, and veterinary medicine. Consequently, a substantial need exists to enhance efforts to educate youth about agriculture careers and ultimately attract them to prepare for careers as food and agricultural scientists and professionals. This proposal therefore seeks to develop an outreach program that engages K-12 students in broadening their awareness of the diversity of career opportunities in the agricultural industry and to attract them to the food and agricultural sciences at UMES. The objectives of this proposal are to i) develop a K-12 agriculture curriculum that is integrated into established summer youth programs at UMES; ii) educate under-represented youth about the food and agricultural sciences through experiential learning; iii) acquire resources to develop indoor classrooms and outdoor learning environments; iv) provide service-learning, mentoring, and employment opportunities for students enrolled in the Department of Agriculture at UMES; and v) provide financial incentives to enable and encourage outstanding program participants to pursue and complete an undergraduate degree in the food and agricultural sciences.

b. Impacts. Developing a K-12 agriculture curriculum that educates under-represented youth about the agricultural industry through experiential learning will help to communicate a more positive image of agriculture while reaching a larger pool of youth to help address some of the complex issues facing UMES, many Colleges of Agriculture, and the agriculture industry.

c. Source of Funding: CSREES- Capacity Building.

d. Scope of Impact: Local, regional and National.

University of Maryland, College Park, Accomplishments FY06

Promote faculty and staff

- The College web site remains our key strategy for providing seamless access to the College's educational resources. It is also a major vehicle for promoting the achievements of our faculty and staff. The college homepage has raised the visibility of the college; students whose photos are featured on the page are recognized by students from other colleges on campus. Our new content management system now enables AGNR faculty and staff to easily create and maintain faculty/staff profiles, on-line newsletters, calendaring system, hot topics for major events, and front-page marketing splashes as needed.
- News Bites, the college's new electronic newsletter, focuses on recent faculty/staff accomplishments.
- Regular submissions to University news outlets, i.e., Outlook, Diamondback, new Terp Magazine. Stories are pitched as needed.
- AGNR-published news releases are compiled from the University Clipping Service and emailed to all faculty/staff on a regular basis.
- 3 issues of MomentUM (Fall, Winter, and Spring) were distributed to 10,000 alumni and friends of the College. Extra copies are distributed to County Education Centers for use with local stakeholders.
- The Marketing and Media Services (MMS) unit coordinated media coverage and crisis communications for major events affecting the College and its faculty (academic and field). Worked closely with University Relations on College media events and marketing campaigns. Promoted the College and its statewide impacts at various government and local function including the MD Association of Counties (MACo), National Association of State Universities and Land-Grant Colleges (NASULG) open house at the Congressional Rayburn Building, MDA open house, UMD's open house at Maryland Day, and all AGNR Research and Education Center open houses.

Maintain quality leadership team, serving all units within the College

- The Marketing and Media Services unit and the Information and Education Technology (IET) unit provide leadership, coordination, and support for the following four areas: media services, marketing/media relations, IT, and e-Learning.

Meeting bi-monthly or as needed, major initiatives/progress/problems/successes are shared and new strategies/problem solving techniques are discussed.

- An on-going challenge is to creatively add value to existing departmental resources and research programs. New efforts are being implemented to address departmental websites, branding the College with the university, and greater support for faculty users of WebCT and other collaborative technologies.

Relate outcomes and achievements to undergraduate and graduate education

- Maintained and updated an on-line web-based advising system that is being shared with others departments on Campus.
- Work with the academic programs office to support alumni events (banquet, exhibits, marketing items, newsletter, etc.), Maryland Day activities, marketing of new academic scholarships/programs.

Extend College's outreach and extension mission

- 100% of off-campus AGNR offices and statewide locations were upgraded with high-speed Internet connections. This upgrade enables field faculty/staff at all locations to access fully web-based applications, to access to rich media files including audio and video, to experience faster downloads and uploading of data, to have greater access to campus business functions such as ELF and travel applications, and to participate in webconferences and content management via their local websites.
- The information technology services offered by IET stays on-task with the campus's Office of Information Technology (OIT) through EIT's staff liaison with OIT.
- Efforts are underway to place 100% of current inventory into the new College content management system.
- MMS continues to provide writing, editing, and graphic design services, with printing being outsourced. Distribution is handled inhouse on a part-time basis.
- MMS continues to master new technologies; it now offers web design, content development, and navigation and video production and scriptwriting.
- MMS is called upon to provide website creative services to campus units beyond AGNR, e.g., UM's graduate school website; the College of Life Sciences consistently relies on MMS for help producing invitations and event announcements and programs.
- IET's office of distance learning offered a month-long professional development series to train Extension and college faculty and staff about a variety of topics relating to information technology, videoconferencing, web-based applications, e-Learning, and public relations.
- IET and MMS continue to offer courses as needed, such as training using the web content management system, seminars about the AGNR print and web publications process for new educators.
- MMS, with technical support from IET, continues to offer a state-of-the art photo archive library with more than 40,000 images. Archive is accessed by the university, other land-grant universities and Extension services, and USDA.
- IET offered a month-long faculty development series to train campus and field faculty on a variety of topics relating to information technology, videoconferencing, web-based applications, and e-Learning.

- Supports a statewide Polycom (video over IP, H.323 standard) videoconferencing network for Extension and the college.
- Implemented Centra, a webconferencing technology to better enable AGNR faculty/staff the ability to learn, teach, communicate, and collaborate.
- Supported both the marketing and technology needs of producing the annual MD state-wide extension conference for all faculty and staff.
- Distance learning furthered technology-based international opportunities and activities using videoconferencing; frequently facilitates conferencing between the university and universities in the Russian Federation.
- Developed various e-learning courses as part of the Food Safety Risk Analysis E-learning program. Participants include decision makers, scientists, and administrators from 15 countries and throughout the US from both the private and public sector.

MCE is using diversity management principles and practices to implement an initiative aligned with the AGNR and UM Diversity Initiatives and Strategic Plans. The plan's purposes are 1) attracting and retaining a more diverse work force, 2) creating a positively charged work climate, and 3) attracting new audiences to extension programs.

University of Maryland, College Park, Program Updates on Progress

Compliance Activities including Employment, Employment Highlights

- State Selection Committee for Extension Faculty adopted criteria for ensuring more diverse candidate pool; search committees are diverse
- Advertised broadly to 1890, 1994, and Hispanic-serving Institutions: receive announcements of temporary and permanent positions
- Tracking systems includes gender and race/ethnicity search data
- UMES and UM Extension pooled resources to fund one full-time positions for bi-lingual Hispanic Program assistants on the Western and Eastern shore; resulted in award for work with diverse state residents

Compliance and Diversity Initiative Activities

- Activities and seminars about developing more accurate metrics and increasing the accuracy of reporting on compliance and diversity activities
- Workshops focused on the challenges of change and transition as part of becoming a more diverse organization
- Multiple self-assessment instruments in training seminars to enable participants to better understand themselves and their reactions to "differences," "change," and "leading change"
- Limited English Proficiency Policy MCE cited as model by USDA Office of Civil Rights is being actively implemented to benefit citizens of Maryland. *Implementation of LEP policy has begun with a Spanish version of Integrated Pest Management E-Letter and with a Bilingual version of "Kids Taking Charge" (after school safety) educational materials.*
- Pilot project implementation of a Limited English Proficiency Policy for which MCE was recognized as a model by the USDA Civil Rights Office.

Part B. Stakeholder Input Process

University of Maryland, College Park, MD

The College of Agriculture and Natural Resources following the lead of the University of Maryland began the process of developing a strategic plan for the college including both Maryland Cooperative Extension (1862 and 1890) and the Maryland Agricultural Experiment Station. The process was completed and the plan is now available to faculty, staff, students and stakeholders. The information from the Key Informant process described below was used as an input in the plan development process. The strategic plans are available as follows:

For the University: http://www.provost.umd.edu/Strategic_Planning/

For the College: <http://www.agnr.umd.edu/FacultyStaff/index.cfm?Parent=173&ID=292>

Administrative Committees

The Dean's Leadership Council met during the reporting period and provided important feedback from the client groups they represent. In addition the Dean and Director is able to seek specific input from this group as need arises.

Extension Advisory Councils

County Extension Advisory Councils (EAC) meet on a regular basis in most of Maryland's counties and Baltimore City. The EAC's provide insight into and support for the local extension programming. The Regional Extension Directors meet with the EAC's for the counties in each region on a regular basis. In addition the Assistant Directors/Program Leaders and Associate Director occasionally meet with these EACs. Maryland Extension Advisory Council (MEAC) did not meet during the reporting period.

Outcomes 2002

The planning document, Outcomes 2002: A Framework for Our Future, drafted in 1997 continues to serve as a guide for extension programming in Maryland. This is a transition year between "Outcomes 2002" and the new "MCE Strategic Plan for 2008."

MCE Planning Process

MCE began a strategic planning process in the fall of 2002. This process resulted in a revision of the Outcomes 2002 document. The new document is called the "MCE Strategic Plan for 2008" and was fully implemented in 2004.

Statewide Research Planning

MAES participated in a series of listening sessions strategically located around the state in 2005. These sessions were sponsored by the Governor of Maryland and Maryland Department of Agriculture for the purpose of determining the needs of agriculture and rural communities in Maryland. A subsequent publication will be developed in early 2006 outlining these needs and will be the basis for internal directed research efforts in the future.

Key Informant Process

A Key Informant Survey was designed to acquire input from stakeholders. The goal was to hear from Maryland residents who are not part of the usual clientele of Maryland Cooperative Extension and the Agricultural Experiment Station. In the fall of 1999, two questionnaires (community and food systems) were developed and pilot-tested with the Maryland Extension Advisory Council. During the winter, three counties pilot-tested the process and questionnaire. From April until October, MCE personnel collected data from over 200 persons who represented selected sectors of the community and food system. All counties and Baltimore City were represented. Results were shared within the College and with community groups, local and state officials, and other interested groups. MCE uses the information as it continues the planning process for its next five-year plan. The key information process will be repeated in 2005.

Customer Questionnaire

No customer questionnaires were used during the reporting period.

User Input Through WWW

The WWW was not used for user input during the reporting period.

University of Maryland Eastern Shore at Princess Anne, MD

Stakeholder Advisory Council

The plant and soils, and portions of the animal science research units of the UMES Agricultural Experiment Station have chosen the area of *nutrient management and environmental stewardship* as a major focus area. As such, the stakeholder input process includes establishing a *Stakeholder Advisory Council* composed of researchers, educators, poultry producers on the Delmarva Peninsula, The Maryland Department of Agriculture, Chesapeake Bay Foundation, and at least two row crop farmers. This group provides critical feedback, and assists in planning the research efforts to better serve the needs of the community relative to nutrient management. A recent Capacity Building Grant also supports the HACCP roundtable discussions continue to help in the clarification of new and changing regulatory requirements so that the poultry processing companies on the Eastern Shore (5 companies and 11 plants) can be more effective in implementing changes to comply with those requirements.

The first such symposium and meeting of the **Stakeholder Advisory Council** was held on August 8-9, 2004. This symposium provided an excellent opportunity for the students at UMES to be exposed to applied environmental science, enable students to share in and critique scientist research, and work with scientists and land managers in the region to address environmental and economic challenges of various problems associated with nutrient management landscapes. Similar symposia are being planned.

Somerset County Soil Conservation District (SCSCD)

A partnership has been established with SCSCD to assist UMES in planning and achieving objectives relative to agricultural research. Several members of this association also belong to the above given advisory Council. A joint publication was produced in December, 2003 titled "*Managing Drainage Ditches to Reduce Nutrient Loss.*" This organization has assisted us in securing various stakeholder audiences for us to present our research objectives and secure input and assistance.

UMES' Agribusiness Advisory Council which previously focused its efforts on providing advice and counsel to the Dean and faculty on matters pertaining to the department's mission, goals, and strategic planning, was reconstituted to focus primarily on the new Ph.D. program in Food Science and Technology.

Part C. Program Review Process Merit Review Process

Maryland Cooperative Extension like most other Cooperative Extension System institutions has not historically developed a wide-ranging merit review process in the past. The Plan of Work is an articulation of MCE's approach to Merit Review. The University of Maryland Eastern Shore School of Agricultural and Sciences (SANS) and the Ag Experiment Station follows the merit review procedures utilized by the University.

Local Program Reviews

Each MCE Extension Educator is required to develop or update an Individual Extension Plan (IEP also called a Job Description in some MCE documents) each year. These IEP's are updated annually and review internally by Region Extension Directors and State Program Leaders for 4-H Youth Development; Family and Consumer Sciences; and Agriculture and Natural Resources. IEP are shared with the Educator's County/City Extension Advisory Council for merit review and comment. The EAC's are widely representative of the clientele of the county or Baltimore City. *The IEP process was streamlined during 2004 as a result of faculty comments that the process was too complicated. An on-line IEP is currently being developed.*

Each county has developed (and annually updates) a unit plan of work (UPOW). This UPOW is developed and updated with the local Extension Advisory Council. All academic departments with MCE Specialist faculty also develop similar unit plans of work. Focus Teams, consisting of multi-disciplinary faculty, were developed in 2003 to facilitate priority programming. The MCE State Program leaders and administration review these plans to determine the level of conformity with the County/City UPOWs. These will be available for review on the MCE internal web site.

UMES' Ag Experiment Station still abides by the strategic plan developed in 2004. This strategic plan is being used to guide the research and teaching activities of all ag-related programs. At the encouragement of the workshop facilitators, collaborative initiatives with other units external to SANS are being involved in activities that can enhance research and teaching activities in SANS. Two major initiatives are underway focusing on technology and food safety, but most notable is research in agriculture engineering with faculty from the UMES Departments of Engineering and Aviation Science, the Department of Agriculture and the Department of Natural Science.

In addition to the strategic planning document mentioned above, each unit in SANS submits individual faculty goals and objectives and departmental goals and objectives every year. These goals are linked with the University's and the School's and are reviewed annually.

Recently, the University began revising its strategic plan and implemented a new program review procedure. This process allows each department and SANS to determine its strengths, challenges and opportunities.

State Program Reviews

Ideas and issues arising from local and departmental UPOWs are developed into a state plan of work (SPOW). The State Plan of Work takes on two separate forms; the Joint Extension/Research Plan of Work as submitted to the US Department of Agriculture and a local document (currently identified at Outcomes 2002). The SPOW is sent to select 1862 and 1890 extension administrators for merit review. The Northeast Region's Extension Directors have agreed to participate in a shared review of State Plans of Work.

Comprehensive Program Reviews

MCE will conduct a comprehensive and detailed program review of each of the program areas listed above at least every 4 to 6 years. An outside review panel selected specifically for the purpose of the review will conduct these reviews. This panel will seek input from local and state stakeholders as well as well faculty as they assess the overall program in the selected area. The first such review occurred in MCE in the fall of 1996 when a detailed review of the 4-H Youth Development program was conducted. This review, conducted by a panel of 4-H Youth Development professionals from other states, resulted in a review document that is currently being used to guide major changes in the program directions of the program. A 4-H Review Summary is provided as a part of this Plan of Work.

MCE will initiate similar program reviews in Agriculture and Natural Resources and Family and Consumer Sciences programming areas over the next five years. These reviews while costly provide considerable guidance to the administration on formulating programming responses to the plan of work. *No action has been taken on these reviews as of this reporting period.*

UMES' Department of Human Ecology's dietetics program and family and consumer sciences teacher education program, along with agriculture education underwent reviews by their respective accrediting bodies in October and November 2003. The SANS graduate programs, environmental sciences, general agriculture and agribusiness underwent program reviews (including a CSREES review) with external evaluators in the summer of 2005. No significant changes are expected for these programs. Human Ecology programs will be reviewed by CSREES again in April 2006. Currently the university is undergoing review for Middle States reaccreditation, with emphasis on assessment.

Peer Review Process

Peer Review has long been a part of the Maryland Agricultural Experiment Stations' approach to funding research as required under the Hatch Act and for Evan Allen formula funding. This process will be continued on all specific projects. *All aspects of this review process continue during the reporting period.*

Hatch Projects and Evans Allen Projects.

Extended peers in compliance with the guidelines of USDA review all state research projects funded by federal formula funds.

Regional Research Projects.

An external peer committee in compliance with the guidelines of USDA reviews all regional research projects funded by federal formula funds.

Northeast Research, Extension and Academic Programs.

A peer committee in compliance with the guidelines of USDA reviews all NREAP and related projects funded by federal formula funds.

MAES/MCE Competitive Grants.

All projects funded through the MAES/MCE Competitive Grants program are reviewed in accordance with the federal guidelines for project review by a panel of scientist from UM, UMES and other research institutions located in Mid-Atlantic region including USDA-BARC,

Johns Hopkins University, University of Delaware and Virginia Polytechnic Institute and State University.

External Review of Departments

Most units of the College have undergone external review processes that include Extension and Research efforts. The Dietetics Review has been completed and a meeting was held February 2004 with the Acting Dean of the College, however, a decision has not yet been announced. We are awaiting appointment of a new Chair prior to review initiation. The Department of Nutrition and Food Science and Department of Veterinary Medicine are due for external reviews in 2005. In 2006 Department of Agricultural and Resource Economics will participate in an external review.

Part D. Evaluation of the Success of Multi and Joint Activities

Substantial cooperation exists between research and extension in Maryland's two land-grant institutions. This cooperation starts with the administrative level linkages and includes joint appointments and a competitive grants program.

UM Administration.

This cooperation is directed by the administration of Maryland Cooperative Extension and the Maryland Agricultural Experiment Station which are managed by Dr. Cheng-i Wei, Dean of the College of Agriculture and Natural Resources, Director of Maryland Cooperative Extension and Director of the Maryland Agricultural Experiment Station, and his designated Associate Directors. They form a single management team of agriculture research, extension and education at the University of Maryland, College Park.

UMES Administration.

The UM administrative team and the agricultural extension and research administrative team of the University of Maryland Eastern Shore work closely in developing programs for Maryland. Dr. Henry Brooks is the Administrator of 1890 Extension Programs at UMES. He is also a part of the MCE administrative team. Dr. Carolyn Brooks is the Dean of the UMES School of Agricultural and Natural Sciences and the Director of the UMES Ag. Experiment Station. She also works closely with MCP administrative team to bring closer ties to MAES.

Joint Appointments.

MCE and MAES jointly fund a number of UM academic department faculty members. These joint appointments provide for integrated approaches to applied research and extension. Most State Specialists (all faculty members in academic departments) with MCE appointments have at least a partial appointment in MAES. Scientist/Specialists with such appointments are in a position to assess the needs of agricultural and related clientele through personal contacts or through MCE field faculty (Extension Educators). They can with these assessments design both applied research approaches and extension education programs to meet the identified needs. The strength of joint appointments in academic departments is the synergy of work relationships with research scientist working on more basic research needs.

Competitive Grants Program.

MAES provides primary funding for and manages a competitive grants program for agricultural and natural resources research scientists in Maryland. Funding is open to any University of Maryland System institution. The competitive grants program is jointly managed by UMES and UM. The program encourages cooperative research/extension submission. Faculty members with primarily MCE appointments have been major recipients of funding through these grant efforts. Each year a set of funding priorities is established which seek to address priority needs in the state. Field faculty are encouraged to participate in the program and often collaborate with research scientists and extension specialists to request funding. A similar extension program was initiated in 2005.

The efforts identified above continue to provide for effective collaboration among institutions and disciplines --- research and extension --- in Maryland. Collaborations among campus and field faculty are increasing, as are multi-disciplinary approaches to problems solving research. This is evident in some of the Planned Activity reports in Part A of this report.

Critical needs are being met using “multi” approaches in the area of land use, animal waste management and farm profitability. Additionally, MCE has increased its research base for programs in Family, Youth and Communities by placing MCE funded positions in primarily research and instruction based departments of Nutrition and Food Sciences (in AGNR) and Family Studies (College of Health and Human Performance). These efforts closely link research efforts (not all funded by MAES) with the needs of communities in the state.

Multi-state programming efforts are also strong in the Northeast region. Maryland is a participant in these efforts. This is especially true in agricultural Extension programs. Maryland and Delaware continue to seek ways of sharing resources across boundaries. Efforts have begun with West Virginia to seek ways of sharing programming resources, where appropriate, more effectively between the states.

Given below is a list of on-going multi-state joint research projects at the UMES Agricultural Experiment Station with collaborating units that fall under POW goals:

REE Goal 2. A Safe, Secure Food and Fiber System

1. Characterization of Antibiotic-Resistant *Salmonella* spp. Isolated from Processed Poultry

Collaborators: USDA/ARS Microbial Food Safety Research Unit, UMES

REE Goal 4. Achieve Greater Harmony (Balance) between Agriculture and the Environment

- 1. Using fertilizer trials to assess the fate of N in a coastal plain landscape**
- 2. Role of sediments in mediating phosphorus transport of coastal plain ditches**
- 3. Gypsum to reduce soluble and particulate P transport plots**
- 4. Relationship of ditch water quality to field overland/subsurface flow**
- 5. Evaluation of alternative ditch management methods**
- 6. Survey of ditch sediment properties on UMES research farm**
- 7. Modeling nutrient transport from field and ditches**
- 8. N and P manure management plots**

Collaborators: *USDA-ARS, University Park PA, University of Maryland College Park, and the Maryland Department of Natural Resources*

1. Mediating Exposure to Environmental Hazards through Textile Systems (NC170)

Collaborators: *Cornell University, University of Illinois Urbana Champaign*

2. Reduction in Animal Waste Pollution through the Use of Enzymes to improve phosphorus digestion

Collaborators: *UM- USDA-ARS & Rutgers*

Part E. Multi-State Extension Activities

Multi-State Collaboration

Maryland's two Land-grant institutions have sought to collaborate with other states in providing the highest of quality research and extension education programs possible. These efforts are essential to efficient use of resources and in establishing sound research methodology. Maryland has been a participant in the Northeast Regional Research program for a number of years. Joint Research programs have been developed using the regional research approach. These projects are well established in the region.

- Northeastern Groups
 - NorthEast Research Association (NERA)
 - NorthEast Extension Directors (NEED)
- Northeast Region Joint Research-Extension Plan
- Regional Projects
 - NorthEast Research Extension Project (NEREP)
 - NorthEast Research Project (NERP)
 - NorthEast Research Extension and Academic Projects (NEREAP)
- 1890 Region
 - Association of Research Directors: ARD was formed and incorporated in 1972 to coordinate most of the food and agricultural research activities among the 1890 Land-grant Universities, USDA, and other colleges and universities. Through this body, regional research projects are formulated whereby several interested institutions participate. Over the years three such efforts have occurred and supported by several 1890 Land-Grant universities on high priority issues.
- 1890 Extension Directors'

Multi-state extension efforts are extensive for MCE. As a small state with many bordering states and counties, efforts are often targeted to clients in Delaware, New Jersey, Pennsylvania, and West Virginia as well as Maryland. These programs (usually in the agricultural sciences) are often done in cooperation with extension educators in the adjoining states. Recent efforts include workshops on precision agriculture, computer use, risk management, greenhouse IPM, nursery nutrient management, vegetable production and family life. In addition, biosecurity efforts in the poultry industry extend throughout the Delmarva Peninsula states of Maryland, Delaware and Virginia.

These efforts decrease the need for duplicative faculty (especially Specialists) in the various states resulting in greater efficiency of program delivery. In some programming areas, the clients from several states may be required to develop a critical mass for program delivery.

Part F. Integrated Research and Extension Activities

Integration of Research and Extension efforts are described to some extent in a previous section. MCE and MAES programs are both managed by a single individual, Dr. Reggie Harrell (Acting Associate Dean and Director) in the College of Agriculture and Natural Resource. These arrangements, along with the joint funding efforts described above, are paramount in developing a close and effective integration of research and extension.

The effective utilization of joint appointments provides much of the integration of Research and Extension. Extension Specialists at the campus level are rarely hired without a joint appointment in either research or academic programs. Most new hires are well versed in research methodologies and expect to collaborate with other researchers in developing both Extension and Research programs. This is an effective integration process.

Appendix: Table of Resource Commitments by Planning Goal

The following three pages contain the required FORM CSREES-REPT (2/00) in facsimile form for:

- Multi-state Extension Activities
- Integrated Activities (Hatch Act Funds)
- Integrated Activities (Smith-Lever Act Funds)

The forms are submitted in electronic form and are not signed.

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

Institutions University of Maryland
University of Maryland Eastern Shore
 State Maryland

Check one: Multi-state Extension Activities
 Integrated Activities (Evans Allen)
 Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures

Title of Planned Program/Activity	<u>FY2002</u>	<u>FY2003</u>	<u>FY2004</u>	<u>FY2005</u>	<u>FY 2006</u>
Goal 1 - To Achieve an Agricultural production system that is highly competitive in the global economy	<u>\$333,919</u>	<u>\$333,846</u>	<u>\$304,881</u>	<u>\$307,152</u>	<u>\$302,079</u>
Goal 2 - A safe, secure food and fiber system	<u>\$38,676</u>	<u>\$39,069</u>	<u>\$40,631</u>	<u>\$40,934</u>	<u>\$40,258</u>
Goal 3 - A healthy, well-nourished population	<u>\$129,388</u>	<u>\$130,702</u>	<u>\$135,930</u>	<u>\$136,943</u>	<u>\$134,681</u>
Goal 4 - Achieve greater harmony (balance) between agriculture and the environment	<u>\$210,181</u>	<u>\$212,315</u>	<u>\$220, 807</u>	<u>\$222,452</u>	<u>\$218,778</u>
Goal 5 - Enhanced economic opportunity and quality of life for Americans	<u>\$113,528</u>	<u>\$114,680</u>	<u>\$119,267</u>	<u>\$120,155</u>	<u>\$118,170</u>
Total	<u>\$825,692</u>	<u>\$830,612</u>	<u>\$821,516</u>	<u>\$827,636</u>	<u>\$813,966</u>

 Director Date April 1, 2006

Institutions University of Maryland
University of Maryland Eastern Shore
 State Maryland

Check one: ___ Multi-state Extension Activities

Actual Expenditures

Title of Planned Program/Activity	<u>FY2002</u>	<u>FY2003</u>	<u>FY2004</u>	<u>FY2005</u>	<u>FY2006</u>
<u>Goal 1 - To Achieve an Agricultural production system that is highly competitive in the global economy</u>	<u>\$412,174</u>	<u>\$412,736</u>	<u>\$234,554</u>	<u>\$422,233</u>	<u>\$418,287</u>
<u>Goal 2 - A safe, secure food and fiber system</u>	<u>\$23,326</u>	<u>\$23,358</u>	<u>\$354,332</u>	<u>\$399,284</u>	<u>\$395,553</u>
<u>Goal 3 - A healthy, well-nourished population</u>	<u>\$34,989</u>	<u>\$35,036</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
<u>Goal 4 - Achieve greater harmony (balance) between agriculture and the environment</u>	<u>\$227,364</u>	<u>\$227,674</u>	<u>\$610,084</u>	<u>\$520,710</u>	<u>\$515,844</u>
<u>Goal 5 - Enhanced economic opportunity and quality of life for Americans</u>	<u>\$2,411</u>	<u>\$2,415</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
<u>Goal 6 – Agricultural Communications, Enhancing Customer Satisfaction Information Technologies</u>	<u>\$0</u>	<u>\$0</u>	<u>\$146,657</u>	<u>\$100,802</u>	<u>\$99,806</u>
<u>Goal 7 – Multicultural and Diversity Issues</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>	<u>\$30,615</u>	<u>\$30,329</u>
Total	<u>\$700,264</u>	<u>\$701,219</u>	<u>\$1,345,628</u>	<u>\$1,473,644</u>	<u>\$1,459,873</u>

April 1, 2007
 Date

Form CSREES-REPT (2/00) Facsimile

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

Institutions University of Maryland
University of Maryland Eastern Shore
 State Maryland

Check one: ___ Multi-state Extension Activities
 ___ Integrated Activities (Evans Allen)
x Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures

Title of Planned Program/Activity	<u>FY2002</u>	<u>FY2003</u>	<u>FY2004</u>	<u>FY2005</u>	<u>FY2006</u>
<u>Goal 1 - To Achieve an Agricultural production system that is highly competitive in the global economy</u>	<u>\$458,711</u>	<u>\$488,228</u>	<u>\$517,521</u>	<u>\$522,203</u>	<u>\$513,767</u>
<u>Goal 2 - A safe, secure food and fiber system</u>	<u>\$23,680</u>	<u>\$25,204</u>	<u>\$26,716</u>	<u>\$26,958</u>	<u>\$26,422</u>
<u>Goal 3 - A healthy, well-nourished population</u>	<u>\$35,521</u>	<u>\$37,807</u>	<u>\$40,075</u>	<u>\$40,438</u>	<u>\$39,633</u>
<u>Goal 4 - Achieve greater harmony (balance) between agriculture and the environment</u>	<u>\$300,065</u>	<u>\$271,161</u>	<u>\$227,199</u>	<u>\$229,255</u>	<u>\$225,470</u>
<u>Goal 5 - Enhanced economic opportunity and quality of life for Americans</u>	<u>\$7,715</u>	<u>\$8,212</u>	<u>\$8,704</u>	<u>\$8,783</u>	<u>\$8,638</u>
Total	<u>\$825,692</u>	<u>\$830,612</u>	<u>\$820,215</u>	<u>\$827,636</u>	<u>\$813,930</u>

 Director Date April 1, 2007

Form CSREES-REPT (2/00) Facsimile