Virginia Tech and Virginia State University
Agricultural Research and Extension
FY 2001 Annual Report of Accomplishments and Results

The following is the Virginia Annual Report of Accomplishments and Results for October 1, 2000 through September 30, 2001. The report includes the Agricultural Research and Extension programs at Virginia Tech and Virginia State University.

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A. National Goals

Goal 1: To achieve an agricultural production system that is highly competitive in the global economy

Overview

Continued research (basic and applied) and extension activities in agricultural production systems are vital if the U.S. is to continue providing safe, nutritious and affordable food to consumers. Without such activities the U.S. can neither compete effectively for export markets nor achieve greater harmony between agriculture and the environment. Publicly funded food and agricultural research is needed what with private sector research largely devoted to new product development and proprietary issues.

Work in the Goal 1 area stretches from existing and emerging plant, animal, and human food borne diseases to improved technologies and practices for producers, processors, and consumers. These improved technologies are being designed to promote risk-reduction and nutrient-and natural resource-preservation.

Competitive farmers, ranchers and fishermen with the right knowledge and tools can ensure that 1) livestock, dairy, poultry and seafood enterprises thrive; 2) consumers get safe and nutritious food; 3) animal health and well being is enhanced; and 4) wildlife benefit from improved animal health and enhanced environmental stewardship. Food animals, including aquacultural species, fare better in the care of knowledgeable producers and processors, allowing communities to reap financial rewards from animal-based food processing industries.

The investment in crop and plant research is another key to food security and is crucial to maintaining a diverse food and fiber supply. World population will double in the next 40 years. Most of the arable land is already under cultivation. To sustain high levels of production and ensure a healthy environment, agriculture will have to be profitable, environmentally sound, and research-based. Yield is subject to its own biologically imposed limits. Increased productivity depends more and more on genetic resources and biotechnology coupled with sustainable management practices to protect the environmental integrity of natural resources.

Some of the key issues important to achieving an agricultural production system that is highly competitive in the global economy include:

1. **Agricultural Genomics** to identify agriculturally significant genes to improve and diversify our crop, livestock, aquaculture, horticulture, and forestry products. The emerging field of bioinformatics is helping researchers analyze the large datasets of gene sequencing information;
2. **Value-Added and New Use Products** to maximize production output from existing and new agricultural products while reducing waste and preserving natural resources and wildlife habitats; and
3. **Environmental Stewardship** to improve current agricultural production practices, especially in animal production, air and water quality, forestry, and pest control.

Achieving sustainable environmental and natural resources systems must be done in a way that is compatible with economic growth.

Finally, a number of non-researchable, albeit policy-based, issues are important as we move into this millennium. First is the need for continued public communication and outreach on agricultural production. We need to clearly articulate the value and importance of agricultural research to our economy and to society as a whole. As we do this, we must use modern information technologies to communicate this message to citizens. Further, the use of sophisticated decision support systems and information management systems will be vitally important as well as narrowing the "digital divide." Last and certainly not least is the need for on-going research preparedness and response capability. We must be willing and able to thwart probable threats to the world's future food and fiber systems. We must be wary of potentially pandemic diseases, unusual climatic conditions, and security threats of accidental or deliberate infection or contamination.

Key Themes

Animal Production Efficiency

Virginia Cooperative Extension conducted twenty-nine county or regional meetings for dairy producers and dairy consultants with the primary theme of "Managing Heat Detection on Your Dairy". An initial survey revealed that approximately 20% of the program participants were using a synchronization program that eliminates the need for estrus detection. However, based on an exit survey, as a result of these meetings, 40 to 60% of those attending planned to adopt a program that minimizes or eliminates heat detection and utilizes timed artificial insemination.

Virginia Cooperative Extension conducted a pilot "State Milkers School - Milkers Certification Program" in Augusta County. The objective of the program was to provide a practical and applied training course for milkers and to help assure a trained workforce for Virginia's dairy industry. This program targeted underserved clientele, including those of Hispanic origin. Materials written in English were converted to Spanish, and an interpreter was used to assist with the instruction of 17 individuals representing three dairy farms.

Virginia Cooperative Extension taught the VA Cow Calf Management Course, an intensive 5-month course on basic beef cattle management, to 140 beef cattle producers having approximately 7,000 beef cows. Producers rated the course as the best extension program they had experienced (9.17 out of 10) and considered the course very useful to their operation (4.71 out of 5). As a result of this course, producers are increasing the use of management practices such as body condition scoring, cross breeding, pregnancy diagnosis, and the use of proper injection sites. Conservatively, these practices should increase annual gross income by $17 per cow.

The Virginia State University (VSU)/ARS project "Aspects of Early Embryonic Development and Maintenance of Pregnancy in the Goat" serves to meet the increasing growing global demand for meat, and to assist small and limited resource goat producers to supplement and increase their income. Goats have difference forage preferences from cows and sheep, they can be used in production systems to complement other species for pasture and land management

schemes. Profitability in low-input production systems as found in the southeast, requires breeds that are reproductively efficient and environmentally adapted. Embryonic mortality reduces potential number of animals born by 20% to 40%, resulting in a reduction of Virginia sheep and goat producers income by approximately $1.2 million each year. The information generated from this two-year old project on the processes involved in embryo development and luteal function will eventually serve to develop the methods to reduce embryonic mortality and boost producer income potentials.

The VSU/ARS project "Small Ruminant Meat Production for Virginia: Effects of Species, Breed and Mating System" serves to provide information to farmers on the input requirements for forage-based, sustainable production of meat goats and hair sheep for niche markets and help to establish economical production systems for these two species thus increasing farm profits. Results of the first year experiment of this project confirms differences in growth and carcass characteristics' s between hair sheep and meat goats, and point to unique differences in Katahdin hair sheep and Myotonic goats within the two species. This information on the input rates and carcass merit of meat goats and hair sheep under high forage management system will help to establish economical production systems for these two species. One research article of these findings was published in the referred Journal of Animal Science in FY2001. One presentation of research findings from this project was given at a professional meeting. One presentation was also made to approximately 130 goat producers at VSU Annual Goat Expo in FY2001.

Coyote and feral dog damage resulted in over $11,000 in loses in Clarke, Shenandoah, and Warren counties during 1999-2000. At the request of the Shenandoah County Board of Supervisors, Virginia Cooperative Extension updated the Public Safety and Code Administration Committee on existing coyote bounty programs that are administered statewide, and alternative coyote control options. In addition, an educational program was conducted for 22 producers on ways they could use the Virginia Coyote Control program and what they could do as producers to reduce predation damages. One-on-one visits with six producers were used to develop plans for improved fencing techniques and to utilize management strategies to reduce the risk of coyote and dog predation.

Agricultural Profitability

With the assistance of the Virginia Cooperative Extension Agent in Orange County, beef producers in a local cattlemen's association pre-conditioned 610 feeder steer calves and sold them in trailer load lots for $3.00 per cwt. over the market price compared to steers sold in state-graded sales and tele-auctions the same week. Producers received a total of $12,810 in premiums, which is equivalent to $21 per head. These prices were over $5.00 per cwt more than weekly sale average prices.

Over 1200 heifers were enrolled in the Virginia Premium Assured Heifer (VAPAH) Development Program, which was developed by Virginia Cooperative Extension in cooperation with the Virginia Department of Agriculture and Consumer Services and the Virginia Cattlemen's Association. Seven hundred and sixty-eight VA Premium Assured Heifers were sold for $703,452.04. These heifers brought $84.77 more per heifer than non-VAPAH heifers in the same sales resulting in an increased profit of $65,103.36 to producers participating in the program**.**

Sheep producers have watched prices for wool fall to a level that doesn't cover the cost of the shearing. Many producers have indicated an interest in sheep breeds that do not require shearing. As a result, Virginia Cooperative Extension in Rockingham County has provided information through workshops and individual contacts regarding hair sheep breeds and available sources of breeding stock. Starting in 1999, a Rockingham County sheep producer, utilizing Extension information and other sheep resources put together a hair sheep flock that is now marketing breeding stock in two states.

The Virginia State University (VSU)/ARS project "Development of A Sustainable Systems For Production of Specialty Crops" is to assist farmers to diversify their farming operation using inorganic fertilizers thus reducing input costs and farm profits and pollution of water resources. One referred journal research publication was generated from this project in FY2001. Two research presentations were also given at professional society meeting, and VSU Agriculture Field Day.

The VSU/ARS project "Inheritance Study of Vegetable Soybean for Isoflavone Content and Pod Shattering Resistance" was a follow-up project for developing varieties of vegetable soybean suitable to Virginia and the mid-Atlantic region to assist farmers in these areas to diversify their farm operations to increase profit. Vegetable type soybean contains isoflavones that may greatly benefit human health, but pod shatter at maturity. The identification and development of vegetable soybean lines high in isoflavones and devoid of pod shattering at maturity will assist these farmers to capture the U.S. and export markets for vegetable soybean which is high in demand. The availability of soybean breeding lines specially bred as vegetable soybean have the potential to generate more income for depressed tobacco farmers in Virginia and others. This research is progressing. Two referred journal articles from this research were published in FY2001.

Through a Virginia Cooperative Extension educational program conducted in Greeensville County, 70 percent of the peanut producers reported a change in the variety of peanuts planted as a direct result of information presented. This change in variety use resulted in greater yield potential and reduced pesticide application requirements for producers generating an estimated net increase of 3 percent profit.

Virginia Cooperative Extension conducted three area meetings and two on-farm meetings in Charlotte County to help producers understand the new tobacco barn conversion program. As a direct result of these barn meetings, 38 county producers converted 69 barns to meet the mandated marketing requirements for 2001. The VCE Agent assisted 37 of these producers in completing the required paper work/applications to be eligible to receive assistance from The Flue-Cured Tobacco Stabilization Cooperative Program. Of these 37 producers, they received a minimum of $2,600 per barn assistance for converting 63 barns. This was a cost savings to these tobacco producers of $163,800.

Animal Health

Role of Stress in Lung Injury of Animals - Environmental stress, caused by shipping of animals, is known to suppress the upper lung immune and other defense systems allowing invasion of opportunistic organisms, a major cause of morbidity, mortality, and economic loses in feedlot

cattle. This VAES project determines the mechanisms of the action of tumor necrosis factor-alpha (TNF-alpha) in mediating acute lung injury. Free radical scavengers will be administered to potentially protect the cells against the lethal effect of TNF-alpha. Environmental stress, caused by shipping of animals, is known to suppress the upper lung immune and other defense systems. Tumor necrosis factor (TNF-alpha), a macrophage derived polypeptide hormone, is known to elicit its biological effects in causing acute lung injury. The role of oxydative stress is being studies in TNF-alpha-mediated acute lung injury as elicited by of Pasteurella haemolytica lipopolysaccharide (LPS). Results have shown that alveolar macrophages in culture produce TNF-alpha when challenged with LPS. Lipid peroxides, the oxidized lipid products generated when reacted with oxyradicals, were found to be significantly higher in TNF-alpha sensitive cells than in the resistant cells. Also found was that the sensitive cells have lower levels of antioxidants, such as GSH, in them than the resistant cells. Impact - Lung cells are highly sensitive to bacterial proteins. These cells play an important role in defending animals against bacterial infection such as the one causing shipping fever. The sensitive cells more are prone to oxidative injury than the resistant lung cells. These cells are also found to have less antioxidant defense than the resistant cells. These results provide a basis for using antioxidants in protecting animals against development of fetal pneumonia during shipping.

Development of Intestinal Enzymes in Tilapia - Little is known about the normal developmental appearance and distribution of digestive enzymes in tilapia's intestinal tract. This VAES research studies the temporal appearance of selected enzymes from fry to young adult, and determines distribution of these enzymes along the length of the intestinal tract. Results should allow improved feeding practices and thus improved health and production of the fish. The post-hatching development of enzyme activity in the intestinal tract of the Nile tilapia has been documented from hatching through attainment of the extremely complex definitive form. By daily sampling of fish from hatching through 14 days post-hatch, all six enzymes tested (maltase, leucine aminopeptidase, dipeptidyl peptidase, lipase, non-specific esterases, and alkaline phosphatase) were determined to be in the intestine before the onset of active feeding by the hatchlings. Impact - The Nile tilapia is extensively cultured worldwide as a human food source, and is unique in many respects from other cultured species. Knowledge of the onset of gut enzyme activity should assist development of age-appropriate feed formulations aimed at increasing growth efficiency and production performance, thus decreasing cost to producers and consumers of this economically important species. This work represents the first description of enzymes in the developmental stages of Nile tilapia.

Antimicrobial Resistance of Food Borne Diseases in Turkeys on Farms - Turkey production disease control can lead to antimicrobial drug resistance. This VAES project focuses on the design of on-farm strategies for control, prevention, and/or eradication of food borne disease, and prevention of transfer of antimicrobial resistant food borne disease from turkeys. Biochemical fingerprinting and antimicrobial susceptibility tests were performed on E. coli and Campylobacter spp. isolates from flocks, and somatic antigen serologic testing and PCR for potential virulence genes were conducted on 299 strains. This included all clinical isolates and fecal isolates that had similar traits to clinical isolates. Most avian E. coli infections were caused by a few clonal strains that were uncommon in normal fecal flora. The potential virulence genes iss, K1 and tsh were detected more frequently among clinical than fecal isolates; however, the pattern of occurrence did not suggest that these genes were useful markers for identifying

pathogenic strains. A Bayesian model to estimate sample size confirmed the diversity of avian fecal E. coli strains. Impact - This study provides guidance in determining sampling and testing approaches to determine the Campylobacter spp. colonization status of turkey flocks. Also determined is variety and virulence of Escherichia coli and antimicrobial resistance patterns when either treating disease colibacillosis or evaluating potential for transmission of antimicrobial resistance through the human food chain.

Control of Animal Parasites in Sustainable Agricultural Systems - Livestock parasites continue to be an important source of economic loss to producers. This VAES project studies protozoan and worm parasites of livestock and attempts to develop integrated control programs using both traditional and novel approaches to control. Equine protozoal myeloencephalitis (EPM) is the most important protozoal disease of horses in North America. This study examined the efficacy of pyrantel tartrate in inhibiting merozoite production of Sarcocystis neurona in cell cultures and in preventing clinical disease in interferon-0 gene knockout mice. Pyrantel tartrate had little activity in cell culture. A dose of 25 ug/ml caused a 34 percent reduction in merozoite production. No activity was seen against sporocyst-induced S. neurona infections in mice treated prophylacticly with 4 mg pyrantel tartrate per mouse per day in the drinking water. The project leaders have developed a new test, Sarcocystis neurona agglutination test (SAT), to detect S. neurona antibodies in horses and other animals. They used SAT to examine the prevalence of antibodies to S. neurona in wildlife and determined that the prevalence of antibodies in raccoons is very similar to that of horses. This new test may aid in understanding the epidemiology of EPM and in identifying new intermediate hosts. Further, the project is currently evaluating candidate vaccines in a gerbil model of neosporosis. The project leaders hope to vaccinate cattle against abortion-causing agents using this approach. Impact - Results of experiments on breed variation in resistance to gastrointestinal parasites of sheep will help producers breed for resistance rather than relying solely on chemical means of control. Development of a new diagnostic test for the agent causing EPM in horses will permit better understanding of the distribution and transmission of this important equine parasite.

In a series of 5 dairy hoof health workshops conducted by Virginia Cooperative Extension throughout the State, 95.2% of the respondents indicated that they had learned 1 or more (avg. 2.6) management practices, techniques or treatments that they would be able to use to improve hoof health in their herd during the next year.

Virginia Cooperative Extension conducted nineteen dairy herd book clinics in Amelia, Nottoway, Prince Edward and Cumberland Counties. A herd book clinic involves an in depth review of the herd's records, which is used to help with troubleshooting and identification of ways to improve profitability.

Virginia Cooperative Extension conducted workshops on two Southwest Virginia dairy farms on the subject of "Hoof Health and Down Cow Therapy." A float tank for down cows was demonstrated in each of the programs. Fifty-two producers attended the workshops and as a result, dairy producers purchased two Aqua Cow tanks. During the first month of their utilization, four cows were reported as being saved using the water therapy device. This resulted in a savings of over $8000 in animal replacement costs to these farms during that one month alone, and paid for the equipment during its first month of operation.

Animal Genomics

Genetic Improvement of Dairy Cattle Using Molecular Genetic Information – This VAES project is a collaboration between several universities that provide data on differences in the genomes of dairy cattle. This project develops and applies statistical methods and computer programs to correlate genome differences with traits of economic importance in dairy cattle genetic improvement. Research focuses on the detection of genes and gene networks affecting traits of economic importance in livestock including dairy cattle, via gene mapping and microarray gene expression data analysis. Project leaders are developing a class of multi-locus genotype samplers, which are referred to as descent graph Markov chains. These are required for implementations of statistical gene mapping methods in complex pedigrees extending over multiple generations and having incomplete marker genotype information. Also being developed are statistical methods to design microarray gene expression profiling experiments, to detect which genes are differentially expressed in these experiments, and to infer features of metabolic pathways and gene regulatory networks. Methods are applied to simulated and actual expression data including an experiment using expression profiles for discrimination among developmentally competent and incompetent bovine embryos resulting from nuclear transfer cloning. Impact - This research is leading to the identification of genes and gene networks that can be selected for and subsequently manipulated to induce genetic changes that are desirable. For example, one change of interest is increasing the efficiency of nuclear transfer cloning in cattle by differentiation among developmentally competent and incompetent embryos.

Biobased Products

Analysis of Bacterial Genes and Enzymes for Production of Useful Chemicals- The use of petroleum as raw material for the production of fuels, chemicals and fertilizers is constrained by the supply of petroleum and may be detrimental to the environment. In this VAES project selected bacteria are examined for their ability to convert harvested plants into useful chemicals. Several species of anaerobic bacteria within the genus Clostridium can produce commercially important amounts of acetone, butanol, and isopropanol (collectively known as solvents). These chemicals were produced by industrial fermentation in the U.S. from 1920 through 1960 and are still produced by fermentation in some other countries. Since the 1980s, there has been an international effort to use the molecular biological tools to study and improve this fermentation. The goals of this project are to understand the mechanisms that control the activities of the genes and enzymes for solvent production and to change the genetic makeup and growth conditions for improving the reliability of the fermentation or increasing the production of the more valuable products. The solvent-producing bacteria have a multitude of the enzyme alcohol dehydrogenase (ADH) for the formation of butanol, isopropanol, or ethanol. To delineate the function of each of the ADHs is a focus of this project. The project leaders have just completed the cloning and sequencing of two genes (adhA and adhB) that code for three ADH isozymes, which are homo- and heterodimers. The amino acid sequences deduced from the genes substantiated the properties we previously determined with the purified proteins. They also identified a gene for a potential transcriptional activator near one of the adh genes, and this gene is similar to a gene we previously discovered near an ADH gene in another solvent-producing bacterium. These findings lead the project leaders closer to a direct examination of the control mechanism for solvent production. Solvent production is not an essential metabolic activity for the solvent-producing bacteria. For solvent production to occur, the bacteria must be provided with the correct nitrogen nutrients. Solvent production is being studied when the nitrogen supply is either via nitrogen

fixation or from three amino acids plus ammonia. The project can now measure the activation of the genes for solvent production and nitrogen fixation in the bacterium Clostridium beijerinckii. Impact - Anaerobic bacteria grow in the absence of air and hence produce a variety of energy-rich chemicals such as n-butanol and isopropanol. These chemicals are commercially valuable as solvents, chemical feedstock, fuels or fuel additives. New knowledge on the relationship between nitrogen metabolism and solvent production can improve the economics of this fermentation. This project aims to improve the microbial conversion of sugars and starch into diverse and more valuable products.

Conversion of Corn Fiber to Xylitol – Corn fiber is a byproduct of the corn wet milling industry that is currently used as low-value ($0.05/lb) animal feed. However, corn fiber has high xylan component that can be hydrolyzed into xylose and subsequently converted into xylitol, a sweetener that has unique pharmacological properties and commands high price ($2-3/lb). The goal of this VAES project is to develop a facultatively anaerobic bacteria method for converting corn fiber to xylitol. Xylitol is a pentahydric sugar alcohol with high sweetening power and unique pharmacological properties. It occurs naturally in low concentrations in fruits, berries, and vegetables. Xylitol prevents tooth decay and it can be used clinically as sugar substitute for diabetic patients, and as parenteral nutrition for post-trauma patients. Clinical studies have also shown that xylitol can prevent ear infection in children, it also prevents skin roughing when used in cosmetic products, and it limits the tendency to obesity when continuously supplied in diet. The goal is to develop bacteria based technology to convert corn fiber hydrolyzate to xylitol. Project leaders have screened seventeen cultures of facultative bacteria belonging to the genera of Corynebacterium, Cellulomonas and Serratia for the production of xylitol from D-xylose. Ten of the seventeen cultures grew on xylose and produced detectable quantities of xylitol. The most promising species identified was Corynebacterium sp. B4247. This species produced about 0.4 g xylitol/g xylose within 48 hours of fermentation. This yield is comparable to yields from some yeast species and appears very encouraging. The project leaders have isolated the xylose reductase enzyme and they are characterizing it for potential modification of the bacterium metabolic pathway. They are also working on some yeast species for comparison of the two microorganisms. Candida tropicalis was selected for this purpose. Impact - About 4 million tons of corn fiber is produced annually from corn wet milling process. This material is disposed as animal feed at $0.05 per pound. However, by converting corn fiber to xylitol, this product will sell for $3.00 to $5.00 per pound. Thus, the development of this technology will provide new high-value applications for corn fiber instead of the current low value-application as animal feed. This technology would have a considerable impact on the United States and Virginia agriculture because it would provide new outlets for corn utilization and thus make it more competitive.

The Virginia State University (VSU)/ARS project “Therapeutic Potential of Soybean and Soybean Phytochemicals on Controlling Type II Diabetes Mell” begin because there is convincing evidence that soy foods have beneficial effects on cardiovascular diseases (CVD) including atherosclerosis. This research attempts to answer if there are any benefits for the use of the purified soy protein or purified isoflavones pills (e.g. effects on CVD, hyperplasis, or ischemic heart). Preliminary data indicate that consuming whole soy or soy flour is more effective in reducing LDL, triglycerides, hyperplasia and increased HDL and elasticity of the arterial wall in animal models. One research referred journal article was published from this research in FY2001.

Plant Germplasm

Plant Genetic Resource Conservation and Utilization - Grasses and cereal crop accessions from the USDA Plant Genetic Resources Conservation Unit, Griffin, Georgia, were used to study systematics and genetic diversity by Dr. K. Hilu at the Department of Biology at Virginia Polytechnic Institute & State University. Dr. Harbans Bhardwaj at Virginia State University has been evaluating 124 accessions of white lupin (Lupinus albus) from NPGS for winter hardiness and alkaloid content. Peanut accessions acquired from the Plant Germplasm Conservation Unit in Griffin Georgia were used for a field day demonstration at the Tidewater Agricultural Research and Extension Center, Suffolk, Virginia. Ms. Mary Ann Silverman obtained several bamboo accessions from Griffin Georgia to evaluate their potential in a trial garden. These activities document distribution and utilization of plant genetic resources, a primary objective of the regional project. The work of Dr. Hilu addresses another objective of the project, i.e., to study genetic relationships among grasses and the genes encoding proteins in cereal crops. Dr. Asim Esen of the Dept. of Biology at Virginia Polytechnic Institute & State University has used teosinte seeds received from the Plant Genetic Resources Conservation Unit for DNA and RNA isolation to clone beta-glucosidase cDNAs and genes. An understanding of genetic relationships and the value of plant germplasm in terms of biotic and abiotic resistances and evaluation of new plant material in trials have traditionally been instrumental in plant domestication and breeding. Impact - Basic studies of relationships among plants and the biochemical diversity among species have been insturmental in the development of new plant varieties through breeding. Public awareness of plant genetic diversity at field day demonstrations serves to strengthen the case for plant germplasm conservation by USDA.

Plant Production Efficiency

Selection and Management of Cover Crops for Sustainable No-Tillage Vegetable Production - Proper selection and management of cover crops is critical for successful production of no-tillage vegetables. This VAES project assesses the effects of cover crop species and residue management techniques on weed suppression and yield of no-tillage vegetables. In previous research, tuber yield of Irish potato has averaged 17 percent higher in no-till (NT), raised-bed production systems than in conventional tillage (CT), hilled systems. Yield enhancement has resulted predominately from increased tuber set and to a lesser extent from increased tuber size. Prior to planting potato seed pieces each year, high-residue levels of rye (Secale cereale) mulch were produced in NT plots, while no cover crops were grown in CT plots. In 2000 and 2001, creamer potatoes (average size = 58 grams) were grown in NT raised-bed systems. Treatments were non-mulched (bare soil) and in situ rye mulch (10.2 t/ha dry weight). As in previous years, tuber set was higher in NT rye-mulched than in NT bare (non-mulched) plots. Apparently, the high-residue mulch in NT raised-bed systems increases tuber set by creating a more favorable soil environment (reduced soil temperature and lower plant-available N levels) for tuberization. Increased tuber set is particularly important for production of creamers and will be explored further in subsequent research. Impact - This research has favorably impacted the adoption of no-tillage production systems for vegetable crops. During the past seven years, acreage of no-till vegetables has increased in Virginia and other states as a direct consequence of enhanced availability of improved no-till equipment and residue management technology.

Chemical Thinning of Apple – The goal of this VAES research is to 10 determine the effects of growth regulators, pesticides, adjuvants and their combinations on fruit thinning, return bloom,

fruit color, and quality, and 2) to determine if the night temperature is important to natural fruit set and the action of applied chemical growth regulators for thinning fruit. Applications of growth regulators, pesticides, adjuvants, and their combinations are being applied to fruit trees at bloom through 30 days after bloom to screen for effectiveness of fruit removal (thinning, and additonal effects on return bloom, fruit color, and quality. Further apple trees grown in root bags in the field and then transferred to environmental growth chambers at different temperatures for various light and dark regimes to determine conditions that trigger increased natural fruit set or fruit drop. In addition, application of chemicals are being made to trees prior to movement in to growth chambers to determine if temperatures after the application are more important. The major cullage factor for apples is inadequate fruit size. Cost of hand thinning may vary from $500-1500/acre, and thus is considered prohibitive. Over-cropping greatly increases the number of small fruit, reduces the next season's return bloom, and reduces crop value. This project determines the potential effects of low light and night temperatures on natural fruit set and effectiveness of chemicals used for fruit thinning. A better understanding of chemical thinner interaction with light and temperature may lead optimizing crop load and higher crop values. Impact - Chemical thinning sprays are used commercially to reduce crop load early in the season, to achieve marketable fruit size, to promote adequate return bloom, and to maintain tree structure. Caustic fertilizers, surfactants, and desiccants applied in bloom were found to interfere with pollination of flowers thus cause early fruit abscission. In addition plant growth regulators were found to cause fruit abscission within the 30 days after bloom. Multiple factors are involved in adjustment of the proper crop load.

Virginia Cooperative Extension Viticulture Specialists met on-site with 63 new or potential grape producers throughout Virginia. Recommendations on site merits, vineyard design, and varietal choice were offered and followed-up in writing. Similar efforts in the previous reporting period were, in part, responsible for a 9% increase in Virginia grape acreage between 1999 and 2000.

The VSU/ARS project “Evaluation of Biorational Pesticides and Development of Strategies to Enhance Biocontrol of Insects” overall goal is to established that botanical pesticides, and more effective use of natural enemies will allow limited resource vegetable greenhouses to reduce or eliminate pesticide use, control pesticide resistant whiteflies, and obtain higher premiums for “organic” produce, and the use of pheromone traps to monitor insect pest populations may reduce the amount of pesticide needed to produce fresh market quality sweet corn in Virginia. As a result of this research, the drop down sprayer technique of the sweet corn IPM system was adapted by commercial fresh sweet corn Virginia producers. This and pheromone trapping gave them the confidence to reduce pesticide applications from his normal every other day routine to every third day. Some botanical pesticides and oils were found to be more effective against whiteflies than the recommended synthetic pesticides. Malathion and endosulfan are no longer recommended for this use. The preliminary results from necatar provision to parastoids led to additional findings to develop this technique in commercial greenhouses. Three (3) state and national presentations on findings of this research were presented by the P.I. during this accomplishment reporting period (FY2001).

Virginia corn growers have been able to reduce losses from gray leaf spot (caused by Cercospora zeae-maydis) by planting their fields to hybrids that have been tested and identified as more

resistant to the disease. This simple change in production practices has reduced the loss to Virginia corn growers in Western and Piedmont regions of the Commonwealth by greater than 2,000,000 bushels of corn in the 2000 crop year.

Virginia Cooperative Extension coordinated five sections of "Timber Marketing and Harvesting" throughout Southside Virginia. Together, these classes provided 60 hours of instruction to 185 participants representing over 41,900 acres of land. A review of pre-course evaluations showed that 67% of respondents had never attended a forestry educational program. Review of post-course evaluations revealed that 98% of respondents felt the course would help them manage their natural resources more effectively.

Virginia Cooperative Extension conducts cotton grower meetings, consultant training sessions, field tours, and field days to provide educational programs on cotton production, and weed, disease, and insect management. As a result, Virginia cotton producers have the highest average yield per acre over the last five years and the lowest cost of production per acre of any cotton producing state in the Southeast.

Virginia Cooperative Extension peanut leaf spot advisories saved growers an average of three sprays of fungicide in comparison to the old, 14-day schedule. Overall, the program saved growers in Virginia about 3.9 million dollars in production of 75,000 acres of peanuts in 2000. Frost advisories were issued from Sept. 25 until completion of harvest in 2000. Frost damage to peanuts in the first few days after digging can reduce crop value from 32 cents/lb to as low as 7 cents/lb. This program continues to be an important service for growers to avoid costly penalties at harvest.

Diversified/Alternative Agriculture

Virginia State University conducted applied research and educational programs on seedless watermelon production as an alternative enterprise for small and limited resource producers. Programs focused on the economic costs and returns, the effectiveness of chemical and non-chemical controls of weeds, insects and diseases, and the marketing procedures for selling seedless watermelons in both wholesale and retail marketing channels. Seedless watermelon demonstration and research plots were established on eight farms in seven counties in Virginia to test crop responses to different soils and growing conditions. Five Seedless Watermelon Field Day programs were held at these demonstration sites. The melons produced at each of these sites were sold in formal test marketing programs set up with both retail and wholesale buyers. Financial budgets were developed that describe the costs of both conventional and organic seedless watermelon production. Seedless watermelon research and demonstration plots were also established at Virginia State University's Randolph Farm. As a result of this educational program, over 100 farmers in Virginia have adopted seedless watermelons as a new farm enterprise.

Virginia State University conducted a program for woodland owners to increase their income from American Ginseng. Applied research focused on 1) the economic costs and returns of wild-simulated American ginseng in Virginia 2) the growth requirements of American ginseng in regard to soil nutrients and site selection 3) the control of pests including slugs, voles and deer and 4) the control of human theft. Ginseng production research and demonstration plots have

been established on 20 different farms in 14 different counties of Virginia to test crop responses to various soils and forest environments. Educational field programs have been held at six of these sites to teach landowners about this enterprise. An Extension publication has been developed and is being distributed through Extension Offices throughout the state. This publication is also posted on the Virginia Cooperative Extension website. Over 400 Virginia landowners have established production of American ginseng as a new enterprise for supplemental income. Most of these growers have started on a small, careful scale. The average level of production is only ¼ acre of ginseng. Average annual yield for these small-scale ginseng growers is about three pounds of dried roots. At $400 per pound, that's an additional $1,200 in farm income per landowner.

Applied research is being conducted at Virginia State University to promote organic agriculture as a niche market for small farmers. Research is focused on determining economic costs and returns of organic vegetable production in Virginia, the effectiveness of non-chemical controls of insects and diseases in vegetable crop production, and the effectiveness of using cover crops, compost and other organic fertilizers to maintain soil fertility. Organic research and demonstration plots have been established at Virginia State University's Randolph Farm. Over 140 landowners attended the Virginia Biological Farming Conference in 2000 to learn about production and marketing of organic crops. A publication entitled *Organic Certification in Virginia* has been distributed through Extension Offices across Virginia. This publication is also posted on the Virginia Cooperative Extension website. About 120 Virginia farms were certified for organic production in 2001. Most of these farmers are certified by the Virginia Department of Agriculture and Consumer Services. A small group is certified by the Organic Crop Improvement Association. There is currently 6483 acres of certified organic crop production in Virginia.

Aquaculture

Virginia State University continued to promote educational programming for pond and cage aquaculture for limited resource farmers, and expanded its Youth Aquaculture Program. More than 40 county or regional programs were conducted throughout Virginia with a focus on fish nutrition, alternative species, fish health, water quality, and other best pond management areas. Multiple workshops were held to promote environmentally sound aquatic weed control techniques. Virginia State University received a grant of $119,000 to further research and conduct educational programs on hybrid striped bass production in open ponds. Through Virginia Cooperative Extension, demonstration sites will be established as learning centers for regional farmers.

Genetic maps of the aquaculture species, Tilapia - Genetic linkage maps were constructed for a family of three-way interspecific tilapia hybrids in this VAES research. The most complete map included 214 segregating markers linked in 24 linkage groups. The tilapia Oreochromis niloticus, O. mossambicus, and their F1 an F2 hybrids were subjected to a cold hardiness challenge. DNA samples were screened with a battery of DNA markers. Analysis showed two genetic markers associated with cold tolerance and three marker associated with growth rate. Impact – Findings such as this can be used for marker-assisted selection for genetic improvement. Further, these findings can be used to accelerate genetic improvement for cold tolerant and growth rate in tilapias.

Determining Dietary Requirements for Cultured Summer Flounder (Paralichthys dentatus) – This is a National Sea Grant research project based at the Virginia Seafood Agricultural Research & Extension Center and done in collaboration with faculty from the Virginia-Maryland Regional College of Veterinary Medicine. Fish grown in recirculating aquaculture systems (RAS) are dependent on artificial diets for their nourishment. In RAS, these diets are responsible for supplying all the essential nutrients required for life functions of the cultured fish, including metabolism, respiration, immune response, locomotion and growth. There are no secondary nutritional inputs and thus a complete understanding of the nutritional requirements of the cultured species is essential for commercially viable RAS. Impact - Aquaculture diets are one of the highest cost components associated with aquaculture. Identifying and developing nutritional complete diets will improve fish growth and health and reduce overall costs associated with flounder production in RAS.

Biotechnology

Impact of Genetically Engineered Crops in Weed Control Programs - Excellent weed control using cost effective and environmentally sound herbicides has been achieved through the use of genetically altered crops in this VAES research project. Excellent control of a variety of annual broadleaf weeds and grasses in soybeans was obtained with glyphosate in soybeans for which tolerance to this herbicide has been introduced via genetic engineering. A single glyphosate application has generally been observed to be sufficient to provide commercially acceptable weed control throughout the growing season. Other genetically engineered soybean varieties, including those with tolerance to glufosinate and sulfonylurea herbicides, allowed weed control that was equivalent or superior to that afforded by standard herbicide programs. Experiments were continued to evaluate alternative control methods for annual ryegrass in no-till corn, because the pending loss of registration for cyanazine will eliminate the primary control method for the species. Single applications of glyphosate in combination with atrazine or sequential glyphosate applications were efficacious for control of annual ryegrass. Glufosinate, sethoxydim, and imidazolinone herbicides were not efficacious for annual ryegrass control. The use of glyphosate or imidazolinone tolerant corn hybrids allowed improved control of troublesome herbaceous perennial braodleaf species including trumpetcreeper, honeyvine milkweed, and hemp dogbane in corn. Impact - Weed control with glyphosate tolerant corn and soybeans, as well as with other herbicide tolerant varieties, was demonstrated to be equivalent or superior to that afforded by traditional herbicide programs. The use of genetically modified crops also allowed improved control of annual ryegrass and perennial broadleaf weeds in corn.

Regulation in Plant Disease Resistance - Fungal, bacterial, viral and nematode pathogens cause serious damage and crop loss. Plant biotechnology researchers have developed transgenic plants engineered for enhanced resistance to plant pests and pathogens. This VAES project discerns the molecular basis of disease resistance and plant pathogen interaction and identifies molecular tools and defense genes required for engineering resistance. The enzyme, 3-hydroxy-3-methylglutaryl CoA reductase, is critical for production of plant sterols and defense compounds. Using tomato Hmg2 promoter:GUS reporter gene fusions, the project leaders showed that Hmg2 is rapidly and locally induced in response to viral, bacterial and fungal pathogens as well as cyst and root knot nematodes and parasitic weeds. Ectopic expression of the defense-specific Hmg2 confers enhanced resistance to viral and bacterial pathogens. Phytoalexin production was significantly accelerated in Hmg2-transgenic lines indicating that HMG2 mediates the rate

limiting step in phytoalexin synthesis and that these compounds are important in limiting disease. Over-expression of HMG2 did not alter sterol production suggesting distinct partitioning of the sterol versus phytoalexin pathways. Subcellular immunolocalization studies of epitope-tagged HMG2 suggest an ER localization in unstressed cells but defense-induced accumulation in vacuoles in cells adjacent to TMV lesion. Co-localization of sesquiterpene cyclase ("cytosolic" phytoalexin biosynthetic enzyme) and capsidiol (the major tobacco phytoalexin) in the vacuole as well, suggest that defense responses may involve compartmentation of the phytoalexin synthetic metabolon. Gene constructions have been initiated to fuse HMG1 and HMG2 with fluorescent proteins for "real-time" visualization of the isoprenoid biosynthetic machinery in cells undergoing pathogen ingress. In addition, transgenic tobacco plants expressing an Hmg2 promoter fused to proteinase inhibitor I were generated to test the efficacy of the Hmg2 promoter in directing pathogen-inducible novel resistance mechanisms for nematode resistance. Impact - These studies on HMGR and phytoalexin biosynthesis have led to new understanding of molecular and cellular mechanisms controlling pathway partitioning and directing intermediate into production of critical defense compounds. Additionally both Hmg2 promoters and coding regions have proved useful in genetic engineering strategies for enhance disease resistance.

GIS/GPS

Applications of Remote Sensing to Forest Assessment and Inventory - Field data on forest resources cannot always provide all the information required for effective management. This VAES project examines ways in which field data on forest resources can be supplemented with remotely sensed data to reduce expense, improve standard errors, provide maps, and enable precision silviculture. Methods that will eventually enable more accurate, objective, and routine use of remotely sensed data for forest assessment and inventory were developed. Major strides in this study area include: (1) a satellite image classification algorithm known as Iterative Guided Spectral Class Rejection (IGSCR) was developed for use with Landsat TM imagery. Corrected forest area estimates obtained from satellite imagery classified via IGSCR for three regions of Virginia were not significantly different (at the 95% level) from the photo-based estimates made using traditional methods. (2) A discriminant analysis of spectroradiometer data (350 - 2500 nm) acquired in late summer from six major forestry tree species, loblolly pine, Virginia pine, shortleaf pine, scarlet oak, white oak, and yellow poplar, revealed that hyper spectral data will often be required for discrimination of species within a taxonomic group, but that multispectral data easily allow differentiation between groups. (3) A test of the applicability of seven common spectral change detection techniques to forest harvest identification in the Virginia Piedmont revealed that users' accuracy is maximized (98.4 percent) with image differencing of normalized difference vegetation index (NDVI) images. (4) A new algorithm to estimate plot-level tree heights using small-footprint imaging Lidar data was developed. It is based on local filtering with a canopy-height based variable window size and is a significant improvement over the more common technique based on all laser heights. Impact - Given the long rotations typical of forestry and the resulting time value of money, these new algorithms will decrease the cost of forest assessment and inventory substantially, saving millions of dollars annually.

Incorporating Auxiliary Information in Forest Inventory Estimates - Obtaining forest inventory estimates is unnecessarily expensive and time consuming. The purpose of this VAES project is to examine methods of incorporating existing information into forest inventories to improve precision, reduce cost and improve profitability. Growth and yield equations have been

constructed that are being combined with forest inventory results. These equations are being used to predict future volumes for use as prior information in inventories. Remotely sensed images have continued to be investigated as a source of prior information. Models are being tested to provide stand level information, and various methods of delineating forest stands with images and other sensor products are being compared. Stand delineation will provide a basis for associating image characteristics with ground conditions and area by forest type. This information is being tested for inclusion in a geographic information system. Global positioning systems are also being evaluated as a means of stand delineation. Recreational GPS receivers appear to be accurate enough to provide area estimates within acceptable tolerances for use in inventory. These receivers will represent a distinct change in GPS use. The equipment is one-tenth the cost of previous equipment and the software is easy to use. Impact - Field foresters can reduce inventory time and increase accuracy by combining past inventory results or growth and yield estimates with Bayesian calculations. Time reductions of 50 percent can be easily achieved.

Agricultural Profitability

Role of Quality Information in the US Soft Red Winter Wheat Industry - The expanding focus on functional traits (such as protein quality, mixing time, starch profile) requires producers to examine their product and process to leverage opportunities since no variety of wheat can satisfy the requirements for every retail product. A decision support system developed through this VAES project will provide the capability to assess risk levels associated with functional traits, management requirements, supply flow, and location consistency of variety response. The Decision Support System (DSS) has attracted significant attention among national and regional flour millers who have agreed to work with the research team to ensure the relevancy of the data. Two years historical data from all Virginia research trials are now incorporated into the model and the data extended to include all classes of wheat that have the potential for economic production in the mid-Atlantic. The DSS has the capability to sort among all varieties in the database for those, which meet the agronomic, and milling/baking specification ranges provided. Users can rank by numerical importance, or by percent-expected contribution to the outcome, the selection criteria. Thus, varieties may be selected according to the specific requirements for manufacturing a product, and/or the needs of manufacturing equipment. Impact - Communications among wheat breeders, growers, millers and bakers have been ineffective in the past because of the different criteria used between each market level to establish value. Wheat market participants need a common language and information set in order to identify and maintain the integrity of value-added quality characteristics in the supply chain. This is not possible in the current agricultural market system using outmoded grain standards and commingled grain. Flour millers have expressed hope that this model becomes the standard for the entire wheat foods chain. Producers are able to choose wheat varieties that meet both agronomic requirements of their location, as well as targeting value-added markets and supply channels**.**

Barriers to U.S. Agricultural Exports - Technical barriers to trade impede exports of U.S. farm products. The purpose of this VAES research project is to evaluate when questionable trade barriers are likely to impede exports and strengthen U.S. efforts to reduce these barriers in the WTO. The thrust of this research was on sanitary and phytosanitary (SPS) and other technical barriers to agricultural trade. These barriers to trade are estimated by the Economic Research

Service of the U. S. Department of Agriculture (USDA) to affect the market access for more than $5 billion of U.S. agricultural exports. The Secretary of Agriculture has made efforts to reduce such barriers a high priority. This research provided an assessment of the incidence and importance of technical barriers based on a 1996 comprehensive USDA survey of foreign markets. It also provided case study and econometric assessments of some of the political and economic factors that are likely to result in excessive use of these barriers. Evaluations were made of performance of the World Trade Organization's Committee on Sanitary and Phytosanitary Barriers in monitoring use of SPS barriers and resolving disputes among members. An economic evaluation of technical trade barriers was made for several specific cases and procedures developed for conducting such studies. Impact - The analyses from this project are contributing to efforts of the United States to negotiate removal of technical barriers when they are unnecessary to protect domestic plant animal and human health and safety. These negotiations take place on a bilateral basis and through international organizations.

Plant Germplasm

Wheat Cultivar Development - Three public and 11 exclusive soft red winter wheat cultivars were released through this VAES research. DNA Markers associated with adult-plant resistance to powdery mildew in wheat were identified and will be used in implementing marker-assisted selection to expedite and accelerate incorporation of durable resistance genes into new cultivars. Three quantitative trait loci were located on chromosomes 1B, 2A, and 2B and explained 17, 29, and 11 percent, respectively, of total variation for mildew resistance in wheat cultivar Massey. Genes conferring resistance to leaf rust in 13 barley accessions were characterized and three unique genes were identified. The disputed chromosome location of leaf rust resistance gene Rph5 was positioned via mapping studies to the extreme telomeric region of the short arm of barley chromosome 3H. DNA markers flanking gene Rph5 and located as close as 0.2 cM will facilitate marker-assisted selection and pyramiding of resistance genes. Leaf rust resistance derived from seven Hordeum spontaneum accessions has been backcrossed into an adapted winter barley cultivar and near-isogenic lines will be released as germplasm. Resistance to Fusarium head blight (FHB) derived from five non-adapted wheat accessions has been backcrossed into seven winter wheat genotypes to develop near-isogenic lines for release as germplasm. Two to four genes were postulated to confer resistance to FHB in two Chinese wheat lines and cultivar Ernie. Mapping studies indicate that Chinese wheat line W14 has loci in addition to that on chromosome 3BS conferring FHB resistance. Effect of 1BL/1RS translocation in wheat on baking quality was studied. Flour of wheat lines with the translocation produced sticky doughs and smaller cookies but had no significant impact on biscuit or cake quality. Research will continue under VA-135656. Impact - Growers would produce 10 to 20 percent less grain if disease resistant varieties were not available and production would not be economical. In addition, quality would be greatly reduced, and presence of toxins could prohibit use of such grain in food and feed products. More extensive use of pesticides would be required for disease control, thus increasing concerns about environment and food safety issues.

As a result of the Corn Silage Testing Program conducted by Virginia Cooperative Extension in Wythe County, 61.3 percent of the dairy producers (46) in Southwest Virginia have identified the research plots as very useful. These producers are now using research-based information to make future decisions about corn hybrid selection for corn silage production.

Virginia Cooperative Extension conducted cotton variety tests and presented results to cotton producers through area meetings and printed material. Ninety-seven percent of Virginia cotton producers use this information to make their cotton variety planting decisions.

Funding and FTE's

Extension Funding

Year	Federal	State	Local	Other
2000	3,139,906	8,773,279	1,575,233	1,332,276
2001	3,234,103	9,036,477	1,622,490	1,372,244
2002	3,331,126	9,307,571	1,671,165	1,413,411
2003	3,431,060	9,586,798	1,721,300	1,455,813
2004	3,533,992	9,874,402	1,772,939	1,499,487

Research Funding

Year	Federal	State	Local	Other
2000	11,554,000	18,662,000	0.0	6,784,000
2001	11,856,000	19,214,000	0.0	6,988,000
2002	12,167,000	19,783,000	0.0	7,198,000
2003	12,488,000	20,368,000	0.0	7,413,000
2004	12,819,000	20,970,000	0.0	7,635,000

Extension FTE's

Year	Professional			Paraprofessional		
	1862	1890	Other	1862	1890	Other
2000	125.9	6.8	0.0	0.4	16.0	0.0
2001	114.1	4.7	0.0	0.4	16.0	0.0
2002	125.9	6.8	0.0	0.4	16.0	0.0
2003	125.9	6.8	0.0	0.4	16.0	0.0
2004	125.9	6.8	0.0	0.4	16.0	0.0

Research SY's Only

Year	1862	1890	Other
2000	98.6	7.43	0.0
2001	99.6	7.43	0.0
2002	100.6	7.43	0.0
2003	101.6	7.43	0.0
2004	102.6	7.43	0.0

Goal 2: To provide a safe and secure food and fiber system

Overview

The prevention of food borne illness is a major responsibility of food producers, processors, distributors, retailers and regulatory agencies. To meet the goal of producing safe food products for Virginia, national and international markets, Virginia Tech faculty have played a major role in developing internationally adopted principles and conducting training programs for producing safe food products. These principles which are called the Hazard Analysis Critical Control Points system (HACCP), Safe Quality Food (SQF) and good agricultural practices (GAPs) serve as a basis for processors and regulatory agencies to identify hazards in producing foods, establishing critical control points in processing for hazard control and monitoring for assuring product safety. Research programs have addressed and will continue to address the sources and incidence of food borne pathogens in ecosystems, ecology of microorganisms, processing techniques to eliminate or reduce pathogens, environmental effects on virulence and infectivity of food borne pathogens, development of procedures to prevent pathogen contamination, and management practices.

Food safety is addressed by extension through workshops with agents, farmers, producers, processors, distributors, retailers and consumers. In addition, extension personnel work directly with each clientele group on food safety issues. During fiscal year 2001, Extension Agents and Specialists contacted 27,226 clientele through their educational programs on food safety. Our undergraduate and graduate students are taught the principles of food safety in most classes including: food microbiology, food processing, advances in food microbiology, dairy processing, quality assurance, poultry processing, veterinary toxicology, (nearly all food animal veterinary courses have a food safety component) and many others. The Virginia-Maryland College of Veterinary Medicine has research, teaching and extension programs that ensure that animals entering the food supply are free of disease. The animals may still harbor organisms that are pathogenic to humans including *Salmonellae, Cryptosporidium*, E. *coli* O157:H7 and others. Programs are on going to develop better detection systems and ways to treat animals harboring pathogens. Food Science and Technology examines food safety issues during processing and develops intervention systems. This department has an active extension program to train processors, distributors, federal, state and local government inspectors, and others. Collaboration projects with the departments of Food Science and Technology, Horticulture, Dairy Science, and Veterinary Medicine are training extension agents to play an important role in farm food safety. These integrated research, extension and teaching projects promote HACCP, SQF and GAPs. The Department of Human Nutrition, Foods and Exercise Science works with consumers to promote food safety. The Department of Hospitality and Tourism works with all aspects of the food service industry to enhance food safety.

Food safety is an issue that affects everyone and must address issues from farm to table. Target audiences include students (undergraduate and graduate), producers, processors, distributors, extension agents, retailers, consumers and federal food inspectors. In addition, extension personnel work directly with each clientele group on food safety issues. University students are taught the principles of food safety in various classes. Extension personnel will continue to develop workshops to train the target audiences. Successful state programs will continue to be expanded to national audiences. We will continue to work with national organizations to insure consistency of delivery materials.

Key Themes

Food Safety

The chemical, physical, and microbiological properties of fresh fruits, juices, meats, poultry, and dairy products can be influenced by new processing techniques. Virginia Tech conducted three studies regarding Escherichia coli O157:H7 in apple cider. As a result of these studies, implementing a washing step for the apples or using ultraviolet light energy to eliminate foodborne pathogens can improve the safety of apple cider. The scientific results of this project have been incorporated into HACCP training materials for cider processors.

In a Virginia Tech study, precooked, ready-to-eat foods, such as uncured cooked turkey breast, caused foodborne illness if the product was not properly handled prior to consumption. The study showed that Clostridium botulinum, if present, could grow under both temperature abuse and extended refrigeration conditions. The products may be potentially hazardous even though there is no off-odor associated with them. Clearly, proper refrigeration and avoidance of excessive storage time is important for product safety.

Consumers, especially in high-risk groups, increasingly rely on microwave heating to cook or re-heat ready-to-eat foods. It has been reported that microorganisms are more likely to survive in foods cooked using microwaves than foods cooked using conventional methods. This increases the concern for the food safety of microwave cooked foods. Therefore, heating procedures using microwaves that assure product safety should be identified. Research conducted at Virginia Tech demonstrated that pathogenic bacteria can survive in foods prepared in a microwave oven. This project will lead to improved cooking processes and cooking instructions to ensure that harmful foodborne bacteria are inactivated during microwave preparation.

Virginia Cooperative Extension initiated a quality control and assurance program for blue crab processors after several firms were contacted by federal and state food regulatory agencies on the presence of microbial pathogens in their products. The quality assurance program included in-plant consultations and microbial surveys of food and non-food contact surfaces, food samples, and personnel. The major sources of contamination were identified and firm management took corrective action. None of the processing plants participating in the program have received Warning Notices from in-plant inspections by regulatory agency representatives within 9 months of the program.

Three Virginia Tech Extension Specialists initiated a food safety education program on “Good Agriculture Practices” for producers of fresh fruits and vegetables in Virginia. The program is directed at food safety production management practices at the farm level. The program was introduced to 20 Virginia Cooperative Extension Agents as a train the trainer program.

Virginia Cooperative Extension provided training assistance for small food processors in the areas of food safety and acidified foods. Thirty processors received training and 100% passed the certification test. The certification is required by the Food and Drug Administration for the food processors to remain in business.

Virginia Cooperative Extension taught 67 senior citizens the principles of food safety. After the training, 18 demonstrated complete understanding of time and temperature controls and risk factors associated with improperly cooked food.

Virginia Cooperative Extension conducted a Starting A Food Processing Business conference at the Highland Center in Monterey, Virginia. Seventeen potential and existing food business entrepreneurs received an eight hour training on business plans, marketing, food processing, and food safety. Of the course participants, 92 percent reported knowledge gain in the areas of food processing and safety and pricing.

HAACP

Virginia Cooperative Extension conducted three Hazard Analysis and Critical Control Point (HACCP) Seafood Workshops for 65 owners and employees of seafood firms in Virginia. The Food and Drug Administration (FDA) requires that seafood-processing firms receive training in HACCP in order to meet federal inspection requirements. These on-going workshops ensure that Virginia seafood processors will successfully meet FDA's inspection requirements. As a result of these workshops, Virginia seafood processors have one of the highest successful seafood inspection compliance rates in the country.

Food Handling

Virginia Cooperative Extension Family and Consumer Science Agents conducted twenty-six (26) Applied Foodservice Sanitation courses (16 hour training) reaching 591 foodservice professionals. Five hundred and ten (510) foodservice professionals (86.3%) obtained national certification by passing a National Restaurant Association examination.

Three hundred and twenty four (324) volunteer food handlers completed the Virginia Cooperative Extension Occasional Quantity Cook course. Fifty percent of course participants who completed a pre- and post-test exhibited a 25% gain in food safety knowledge.

Three hundred and sixty-six (366) foodservice workers completed the Virginia Cooperative Extension Serving Safe Food course (a six-hour training). This training increases knowledge/awareness of safe food handling and potential employment opportunities in the foodservice industry.

Funding and FTE's

Extension Funding

Year	Federal	State	Local	Other
2000	236,863	661,824	118,830	100,502
2001	243,969	681,679	122,395	103,517
2002	251,288	702,129	126,067	106,623
2003	258,827	723,193	129,849	109,822
2004	266,592	744,889	133,744	113,117

Research Funding

Year	Federal	State	Local	Other

2000	513,000	937,000	0.0	346,000
2001	529,000	965,000	0.0	356,000
2002	545,000	994,000	0.0	367,000
2003	561,000	1,024,000	0.0	378,000
2004	578,000	1,055,000	0.0	389,000

Extension FTE's

Year	Professional			Paraprofessional		
	1862	1890	Other	1862	1890	Other
2000	11.4	0.0	0.0	0.0	0.0	0.0
2001	10.4	0.0	0.0	0.0	0.0	0.0
2002	11.4	0.0	0.0	0.0	0.0	0.0
2003	11.4	0.0	0.0	0.0	0.0	0.0
2004	11.4	0.0	0.0	0.0	0.0	0.0

Research SY's Only

Year	1862	1890	Other
2000	4.9	0.0	0.0
2001	4.9	0.0	0.0
2002	4.9	0.0	0.0
2003	4.9	0.0	0.0
2004	4.9	0.0	0.0

Goal 3: To achieve a healthier, more well-nourished population

Overview

Extension and research faculty at Virginia Tech and Virginia State represent expertise in nutrition, foods, exercise science, and health education. Research and Extension programs have addressed consumer behavior and strategies for effecting behavior change, enhancing the nutritional value of common foods, and evaluating the health and nutrition benefits of certain nutrient-rich foods. Chronic diseases such as coronary heart disease, hypertension, diabetes mellitus, osteoporosis, and cancer take a heavy toll on individuals, families, and communities in terms of quality of life, sickness and disability, and health care expenditures. Despite on-going research, the interrelationships of diet, nutrients, lifestyle, genetic inheritance, and risk of disease and disability are not well understood. Basic research is needed to describe the biochemical, physiological, and nutritional aspects of health and disease. Applied research relating to food behavior and the cultural and psychological aspects of food are equally important as we strive to bring about positive food selection practices. Work at Virginia Tech is addressing both the biological and the psychosocial aspects of nutrition and health.

The development of new laboratory methods has enabled us to explore the role of nutrients and non-nutrients at the biochemical and molecular levels, and better evaluate body nutrient needs for optimum health. Inadequate levels of vitamin B-6 adversely affect both the number and the activity of immune cells in both animals and humans, and lower body defenses to harmful substances and microorganisms. The discovery that certain phytochemicals (plant chemicals) impart health-promoting effects has drawn attention to the value of soy protein in the human diet, over and above its protein contribution. Antioxidants occurring naturally in soy protein have been shown to prevent harmful oxidative changes in blood lipoproteins, primarily low density lipoprotein cholesterol (LDL-cholesterol), that accelerate the progression of atherosclerotic vascular disease. On-going work is directed toward isolating the specific compounds that are responsible for this protective effect and the optimum level required. The actions of food-related antioxidants, including vitamin E, on the function and physical integrity of muscle cells and cellular components such as mitochondria are under investigation.

Plant foods including grains, fruits, and vegetables are important food sources of phytochemicals and a parallel research effort to the human nutrition work described above concerns interventions in the food supply that will increase public consumption of these foods and value-added enhancement for Virginia's agricultural community. This work represents joint projects of researchers in the College of Human Resources and Education and the College of Agriculture and Life Sciences. Although breads and cereals are the foundation of the Food Guide Pyramid, many individuals do not eat the suggested number of servings from this food group, and current public health information programs are directed toward increasing dietary fiber and complex carbohydrates. Most of the bread consumed in the U.S. is obtained from commercial bakeries. Hard wheats used in bread-making are a growing agricultural commodity in Virginia, and the primary markets are commercial bakers. Growing conditions, including the type and amount of fertilizer, have been shown by workers at Virginia Tech to influence the baking quality of soft wheat as related to large-scale production using commercial mixers. Follow-up to that project has addressed the baking quality of hard wheat lines as influenced by amount of rainfall. The development of new grain products fortified with soy protein, thus adding both phytochemicals and antioxidants, resulted in a muffin rated acceptable by consumers using sensory analysis methods. Post-harvest quality of fresh produce is of importance to both growers and consumers.

Edible protein-lipid coatings are being researched as a means of preventing water loss and oxidation in apples, and extending their quality shelf life.

Health care costs continue to rise as a consequence of the growing population of older people and the epidemic rise in chronic health problems such as diabetes mellitus and elevated blood lipid levels in individuals of all ages. Nutrition, physical activity, and lifestyle patterns are significant factors in the development or prevention of chronic disease, and research continues to determine the effect of nutrition and activity practices on chronic disease patterns. Heart disease is the most common cause of death in the US for both men and women. With greater media attention to the vulnerability of post-menopausal women to heart disease and the need for women of all ages to monitor their blood lipid levels, many women have reduced their consumption of meat in an effort to lower their intakes of cholesterol and saturated fat. At the same time women are at risk for low intakes of iron, zinc, and copper because of their relatively low energy intakes. Red meat is an exceptionally good source of these minerals in a highly bioavailable form. A current study is evaluating the effect of a moderate amount of red meat as compared with mixed plant and animal protein/fat sources on blood cholesterol and triglyceride levels and iron, copper, and zinc status in women.

Human body composition as related to fat mass, muscle mass, and bone mass is a significant factor in the development of chronic disease and disability. Studies on the influence of appropriate physical activity on body fat, muscle, and bone are being conducted on individuals in various age groups including college men and women, senior citizens, and student athletes. Both physical measurements and dual-energy x-ray absorptiometry (DEXA) are being used to assess changes in body composition. DEXA is also being used to evaluate the influence of calcium intake, hormonal status, and constant dieting on bone mass in younger and older adult women.

Aging changes in muscle fibers occurring at the cellular and molecular level play a role in the loss of both muscle mass and muscle strength. Such changes contribute to the muscle weakness, frailty, and disability observed in cardiac failure, and similar mechanisms may be related to the catastrophic changes that occur in muscle with the onset of the disease condition of muscular dystrophy. Molecular biology methods have made possible the evaluation of changes in muscle contractile proteins and biochemical mechanisms, as well as the loss of neural stimulation to the muscle that may contribute to muscle weakness. Study of these changes can assist in the development of prevention and intervention strategies for these conditions.

Educational strategies including food, nutrition, and health information are promoting the development of positive practices and lifestyle behaviors among youth and encouraging positive behavior change, when indicated, among adults. The Dietary Goals for Americans that define a healthy and varied diet with generous intakes of complex carbohydrates and fiber and limited intakes of fat, saturated fat, sodium, and sugar provide the foundation for programs directed to all age groups. Individuals and families face many choices and conflicting issues when selecting food. Health concerns, economic realities, limited time for food shopping and food preparation, family food preferences, and cultural, religious, or ethnic food patterns exert influence on one's food intake. Extension faculty have used focus group methods to obtain input regarding food and nutrition problems and information needs from working homemakers and health care workers. Many of these participants are single parents with children and issues of limited time for food

activities, limited money for food, and providing appropriate meals for children when work shifts extend over traditional meal times are needs for developmental programming. Focus groups conducted by a Spanish-speaking facilitator with migrant workers pointed to the need for culturally-appropriate materials in Spanish addressing food, nutrition, and health. An equally important lifestyle issue for all population groups is physical activity, as an active lifestyle that includes regular walking or other physical exercise prevents the development of obesity and assists in weight management.

Bone health is an important public health problem in the U.S. Current intakes of calcium among children and adolescents in periods of rapid bone growth are inadequate to support maximum bone mineralization and increases risk of bone disease in later life. The majority of older adults do not consume the levels of calcium recommended to prevent bone loss, and health care professionals continue to express concern about the growing prevalence of osteoporosis and incidence of bone fractures in the older population. Attitudes regarding calcium needs and bone health were evaluated using focus group methods in both younger and older women. It appears that women of all ages recognize their need for calcium, but find it difficult to obtain the amount needed from food. Lactose intolerance among African-American, Hispanic, and Asian populations limit the use of fluid milk. These findings have directed attention to the need for materials that provide guidance on dairy foods low in lactose.

The growing epidemic of type 2 diabetes among children points to the synergism of excessive body fat and a sedentary lifestyle. A new Virginia initiative, Fit for Life, will target childhood obesity prevention from a family perspective. This developmental program, a joint effort of Family and Consumer Sciences and 4-H will address both food selection and the need for physical activity. Children and families are being reached through in-school programs, parents organizations, community 4-H activities, and menus and activities at 4-H camps. Type 2 diabetes is also a growing problem among adults. A current survey is ascertaining the availability of practical assistance in food selection and preparation for individuals who are placed on a diabetic regimen. Based on this need, Cooperative Extension will partner with local health care facilities to assist diabetics in implementation of a diet plan prescribed by a health care professional.

Internal and external linkages

Food and nutrition education and health promotion programs delivered in this reporting year addressed the needs of Virginians of all ages and emphasized a partnering relationship with both private and public agencies. The needs of young children were addressed through workshops for Virginia day care providers. These training programs and materials focused on menu planning and snack selection that pattern the Dietary Goals for Americans and the Food Guide Pyramid for Children Ages 2 to 6. Program content emphasized the importance of fruits and vegetables and the use of high calcium foods.

The Virginia Department of Education has implemented Standards of Learning (SOLs) that now govern all lessons delivered in the public schools in this State. Nutrition, food safety, and disease prevention lessons developed by Cooperative Extension have been approved as meeting at least one of the SOLs, allowing a continuing collaboration with local school systems. Cooperation by the Virginia Department of Education School Nutrition Program, Family and

Consumer Sciences, and 4-H professionals and volunteers has led to both in-school and after-school food, nutrition, and physical activity programs in many localities. Curriculum focusing on healthy eating is being implemented at the six 4-H educational centers in the State, and on-campus specialists are providing assistance in developing menus and selecting recipes for the camp food service program.

Both younger and older adults were reached in various settings coordinated with local businesses, voluntary and civic organizations, and government agencies. Classes held at noon in business and industry settings reached clientele with healthy eating and weight control programs who because of time or transportation problems would not attend evening meetings. In cooperation with the Virginia Area Agencies on Aging, classes at congregate meal sites and senior centers reached elders with an age-appropriate curriculum on nutrient needs, health benefits of foods in particular food groups, cancer prevention, osteoporosis prevention, cooking for one or two, and prudent use of supplements.

Collaborative activities with local health care facilities included sponsorship of community health fairs, classes, and other fitness events. Local Extension field faculty worked with affiliates of several voluntary health associations including the Virginia Heart Association and the Virginia Cancer Society. Faculty members on campus and in the field were active participants in the Virginia Osteoporosis Coalition that represents a joint effort of the Virginia Department of Health, the Medical College of Virginia, and local community health agencies. These programs have included work with all age groups as well as health professionals.

Virginia Cooperative Extension partnered with the Virginia Department for the Aging to sponsor the Governor's Conference on Aging, a two-day educational program attended by more than 500 community leaders, health professionals, outreach workers, and older people. The program, Touching Lives with Creative Solutions, had four conference tracks that emphasized intergenerational activities, strategies for successful aging, work and retirement issues, and long-term care alternatives. The Governor's Conference on Human Genomics, the Family, and the Law, was sponsored by Virginia Cooperative Extension, the Virginia Department of Health and Human Resources, and the Virginia Biotechnology Association. More than 450 medical professionals, legal professionals, community faith leaders, and research scientists participated and discussed such issues as genetic therapies related to health and disease, and family decision-making brought about by genetic testing and screening.

Partnerships with the Virginia Department of Social Services led to cooperative efforts to strengthen community systems serving limited-resource families and to provide direct education to these families in the areas of nutrition, lifestyle choices, and personal health care. Funding that totaled $218,652 was received to support the Temporary Assistance to Needy Families program reaching many cultural and ethnic groups that have traditionally been among the under-served. Enabling a higher level of self-care can promote a higher quality of life and reduce future health care costs.

Family and Consumer Sciences agents and specialists have established collaborative activities with faculty from Agriculture and Natural Resources to address food and nutrition issues receiving national attention. Efforts of the Virginia Small Grains Board and Extension

specialists from the Department of Crop and Soil Environmental Sciences have made possible the development of publications for both children and adults that point to the benefits of grain foods, particularly, foods and recipes containing Virginia wheat and barley. Investigators from the Department of Horticulture and the Department of Human Nutrition, Foods and Exercise (HNFE) are working on the development of edible coatings to lengthen the shelf life of fresh fruits and vegetables and increase the profitability of Virginia fruit and vegetable growers. Researchers from HNFE and the Department of Food Science and Technology used focus groups as a tool to determine factors that influence women's use of dairy products, important sources of biologically available calcium.

The scope of Extension and research in these areas spans disciplines in 20 departments in four colleges at Virginia Tech as well as the School of Agriculture, Science & Technology at Virginia State University. Selected impacts of these projects are described below.

Key Themes

Human Health

Virginia Cooperative Extension conducted a 9-session training program in basic pesticide safety for school employees from Montgomery County (11), Pulaski County (2), and Botetourt County (1). After the training, participants took the examination for the Registered Technician Pesticide Certification Program. All 14 participants achieved passing grades, with an average score of 90%, and were certified by the Virginia Department of Agriculture and Consumer Services. As a result, these school systems have taken an important step to comply with state laws requiring certification of employees who apply pesticides on school grounds.

Telephone interviews were completed with 1,510 women living in rural southwest Virginia to determine their need for and access to community services offering assistance with activities of daily living or social support. Over half reported having chronic conditions including arthritis (65%), high blood pressure (53%), and chronic pain (35%). About one-third of the women had one or more functional limitations and the majority relied on informal supports (family, friends, or neighbors) for assistance, and only 11% relied only on formal supports (paid helpers). Another 11% needed assistance with activities of daily living but no help was available. Services provided by both informal and formal supports included transportation, grocery shopping, and helping around the house. Over 300 copies of a research brief reporting the results of these studies and the home care needs of rural elderly were distributed to policy-makers and health and community-based service providers in rural areas.

Transgenic animals are efficient, cost-effective, and safe systems for obtaining complex therapeutic proteins that can be utilized in the treatment of various life-threatening diseases in humans. Important proteins are secreted by the mammary gland, and pigs bio-engineered to express these proteins in their milk at lactation are excellent production models. Virginia Tech researchers have developed pigs that are producing several proteins of critical importance in the blood clotting and anti-clotting cascade including human Factor VIII, Factor IX, and fibrinogen. This work has the long range potential of producing therapeutic proteins that are safe, efficacious, and available in ample quantity. These important molecules have the potential to save human lives.

Today, 300 to 500 million people are at risk for malaria and 2 to 3 million die from this infection each year. Drug resistant parasites and insecticide-resistant mosquitoes have led to the return of malaria in many areas that were once malaria free. A new strategy for control of this disease includes release of a genetically engineered mosquito that cannot transmit malaria parasites. A genetic fingerprint has been identified that may allow the prediction of mosquitoes most suited for genetic manipulation.

Observations of reproductive and developmental problems in humans have been attributed to endocrine disruption, the process by which chemicals such as dioxins or PCBs in the environment exert toxic effects by mimicking the actions of normal hormones. Such chemicals can be toxic at very low concentrations. This study is evaluating the biochemical process by which these compounds bind to protein receptors and interfere with normal body function.

Cockroaches are pests that inhabit human dwellings, produce odors, may transmit human pathogenic organisms, and can promote serious asthma reactions in humans. Many traditional methods used for their control are no longer effective due to the development of resistance. New studies on the absorption and metabolism of food stuffs by these insects will assist in the development of new pesticidal materials for their control.

Exposure to pesticides has been linked to the development of Parkinson's disease in humans. Studies indicate that insecticides influence the release of dopamine and other neurotransmitters associated with brain function and implicated in brain abnormalities observed in Parkinson's disease. Results suggest that exposure to pesticides may pose a risk for the development of Parkinson's disease in older age.

It would be beneficial from the health standpoint to control the amount and composition of fat in milk. Virginia Tech investigators are identifying the process by which milk lipid globules are formed and secreted into milk and the control proteins that determine this sequence. Intervention in this biochemical process may allow food technologists to alter both the amount of fat and the type of fat secreted, leading to milk with a lower fat level or different levels of particular fatty acids. Such a milk could carry health benefits for the general population.

On-going studies on the effect of trace minerals on bone metabolism and bone loss in laying hens are focusing on boron and nickel. Laying hens are subject to bone loss based on their high level of calcium needs during periods of egg production. Understanding the role of these nutrients in bone metabolism in avians may provide a framework for evaluating their effects in older humans for whom bone loss leads to disability and rising health care costs.

A partnership was formed between Virginia Cooperative Extension and the regional Mental Health Community Services Board to conduct the Virginia Adolescent Resiliency Assessment (VARA) in ten counties. Collaboration with the Office on Criminal Justice Services made possible the completion of the VARA process with adolescents who had contact with the county juvenile justice system. Data obtained from these surveys have increased public awareness about youth issues, led to creation of a Parks and Recreation Commission with a monthly focus on youth, and have been used by community agencies to justify grants totaling $278,000. These

funds were used to develop substance abuse prevention programs, purchase fitness equipment to support physical activity, purchase school curriculum, and provide teacher training.

Xylitol is a sugar alcohol with high sweetening power and unique pharmacological properties. This compound has broad implications for food and health because it 1) does not cause tooth decay as most natural sugars do, and 2) is not metabolized by the body so it does not add energy kilocalories to the diet. Xylitol can be used as a sugar substitute by diabetics and others who are reducing their energy intake to more effectively manage their body weight. Xylitol has therapeutic properties in the treatment of ear infections and in post-trauma parenteral nutrition. Researchers are developing new methods of producing this compound from corn that will increase available supplies and provide a high value application for waste corn.

Consumer demands for fried foods lower in fat have led to investigation of means for reducing oil uptake by food during commercial deep fat frying. Injecting steam or nitrogen into the frying medium has the potential for reducing frying time and thus fat absorption by the food, slowing chemical changes in frying oil that limit its period of use, and improving food acceptability by increasing the crispiness. Edible coatings may also contribute to increased crispiness. These findings have the potential to improve health by decreasing intake of fat while meeting consumer demand for crispy fried food, and lowering production costs in the food service industry.

Both natural components of milk such as skim milk and butterfat and fractionated milk fat have application in the formulation of dairy foods with an improved fat profile. Butter and ice cream with a lower proportion of saturated fatty acids and a higher content of unsaturated fatty acids, especially oleic and linoleic acids, were compared with the natural products in terms of extended storage life and functional properties such as firmness for butter and scooping ability for ice cream. Modifications of the fat content of milk fat can result in dairy products with improved nutritional profiles and high quality and functionality.

Human Nutrition

Concerns about blood lipid concentrations and their implications for health have led many women to evaluate their intake of red meat. For women with high iron needs during the child-bearing years and low to moderate energy intake, meat is an important and highly bioavailable source of iron and other minerals. Researchers at Virginia Tech are evaluating the effect of beef in the diet, in amounts falling within the framework of the Dietary Guidelines for Americans and the Food Guide Pyramid, on blood cholesterol levels and status of iron, zinc, and copper. Both pre-menopausal and postmenopausal women are included in the study. These findings will assist in the development of public health recommendations regarding the use of beef in a prudent diet that reduces cardiovascular risk while supporting optimum trace mineral status in at-risk populations.

Vitamin B-6 is known to play a role in optimum function of the immune system. Immune cells help the body mount a defense against infectious microorganisms, foreign proteins, and toxic substances, and may help protect against the development of a cancer. To characterize changes that occur in immune function in vitamin B-6 deficiency, investigators fed a vitamin B-6 free diet in an animal model and measured the changes in subsets of T cells, B cells, and lymphocytes. Decreases in mature cells of 17% to 45% were observed after several weeks of deficiency and it appeared that normal maturation of immune cells was impaired. The level of

vitamin B-6 required for optimum immune function should be considered in the determination of the Recommended Daily Allowance for human populations.

Edible coatings are being developed to preserve post harvest quality in fresh fruits and vegetables using Golden Delicious apples as a test fruit. Five coatings have been developed that contain a combination of protein-lipid plant gums. Strict specifications for sample preparation, instrument setting, and technician technique were developed for reporting consistent results correlating firmness data derived from texture measurements across laboratories using the Texture Analyzer and Instron. Extended shelf life may encourage consumers to increase their purchases of fresh produce.

Amount of rainfall during the grain-filling growth period can have negative effects on the bread-making potential of hard wheats grown in Virginia. Harvested wheat from eighteen wheat lines grown at three Virginia sites was milled into flour and assessed for bread-making potential on the basis of farinograph analysis, SDS sedimentation volumes, and bread loaf volume. Greater rainfall had a negative effect on gluten strength resulting in doughs with significantly shorter departure times and smaller mixing tolerance stabilities. Three wheat lines, 92Pan#29, 92Pin#122, 92Pin#130, and a control wheat KS85W663-42 gave good bread-making results (loaf volume equal to or greater than 700 cc) regardless of the amount of rainfall received, and thus would appear to be best choices under various conditions of rainfall.

Vitamin C is an essential nutrient for humans, and as a constituent of fruits and vegetables acts as a natural preservative, extending shelf life and consumer appeal. This project is using a model plant system to determine the metabolic sequence that leads to higher vitamin C formation in the plant. Identification of the genes that control this mechanism could make possible the increased production of vitamin C and lead to higher vitamin C concentrations in other edible crops.

"Healthy You" is an intergenerational program developed for both children and senior adults to emphasize the health benefits of eating fruits and vegetables. Senior citizens at Area Agency on Aging nutrition meal sites were trained to mentor and teach simple nutrition concepts to 4-year-old preschoolers from at-risk families. In one group of 48 preschoolers, 86% of the children learned to eat a new fruit or vegetable. An evaluation mailed eight months following program completion was returned by 46% of the families and indicated that the change in the children's food habits had an effect on the family eating pattern as well:

- 93% of the children distinguished fruits and vegetables from other foods
- 86% of the families tried new fruits
- 68% of the families tried new vegetables
- 93% of the families included fruits and vegetables in their diet each day

In a rural planning district, four, 45 minute lessons were taught to 1,634 2nd and 3rd graders in 16 schools. These classes resulted in 74% of the children trying at least one new food, 63% starting to read food labels, 83% drinking more milk, and 76% eating more fruits and vegetables. Among the 3rd grade parents in one school, 60% reported their family almost always washed their hands before eating.

A series of classes on “Feeding Young Children” enrolled 123 child care providers and Head Start teachers. Responding to a six month post survey, 75% indicated they increased the number of portions of fruits and vegetables served in their facility, changed the portion sizes based on the amounts suggested in the Food Guide Pyramid for Children Ages 2 to 6, and found ways to encourage their “picky eaters” to taste new foods.

One hundred fifty-five juveniles housed at a detention home in Chesapeake participated in the Basic Life Skills program. Seventy-five percent increased their knowledge of basic nutrition and budgeting skills.

A follow-up program on How to Make Healthy Food Choices for 49 heart-attack survivors, co-sponsored by Cooperative Extension and the local affiliate of the American Heart Association, indicated that 89% were more aware of correct serving sizes, and 63% stated a positive practice change in their eating habits.

Sixty-four health coordinators of area African American churches in Planning District 15 attended the Eating Heart Smart, train-the-trainer workshop. This workshop was a collaborative effort of the American Heart Association and Virginia Cooperative Extension and was designed to promote heart healthy behaviors within the faith-based community. Fifty-four participants completing pre/post tests increased their knowledge of heart healthy foods, important to their teaching of others.

Among 221 predominately low-income minority men and women who participated in 10 Healthy Living programs, 38% increased their knowledge measured by pre- and post-testing and 24% adopted at least one of the recommended practices of increasing fruits, vegetables, and whole grain foods; eating a healthy breakfast; or exercising at least 3 times per week. Other evaluation comments revealed evidence of progress toward healthy menu planning, food preparation, wise food shopping techniques, and food safety practices.

Fifty-one (51) senior adults participated in eight As You Age nutrition lessons. On a pre-post survey, 84% reported a positive dietary change by increasing their intake of fruits, vegetables, or milk products.

In Amelia County 50 4-H youth participated in a Food and Fitness series conducted as part of the Fun and Sun Day Camp jointly conducted by Virginia Cooperative Extension, Amelia Parks and Recreation, and the CrossRoads Services Board. Fifty percent of the youth learned new ways to exercise. Participants were introduced to nutritious snacks and participated in the preparation of healthy snacks.

The Change of Heart Newsletter is designed to develop skills in food shopping, food preparation, and eating patterns to reduce blood cholesterol, blood pressure, and the risk of heart disease and cancer. A random sample of 136 participants statewide demonstrated that 80% selected fruit and low-fat and high fiber desserts or snacks more often; 78% began to read food labels for cholesterol information; and 95% began to read food labels for general nutrition information.

Among the 3,860 limited resource families that participated statewide in the Expanded Food and Nutrition Education Program (FFNEP) and the 1,961 homemakers that graduated after completing 8 to 10 lessons, the following impacts were identified:

- 49% of the homemakers (1,894 of the 3,860) met the nutrition objectives for graduation by improving their intakes of food groups in the Food Guide Pyramid and also key nutrients (vitamins A and C, calcium, iron, and fiber).

- Adult EFNEP graduates (1,894) made substantial improvements in one or more food-related practices as shown by increased food group servings, with Bread/Cereal intake increasing by1.2 servings per day; Fruit Group intake by ¾ serving; Vegetable Group intake by 1.2 servings, and Milk/Cheese/Yogurt Group intake by 1/2 serving; 95% of homemakers (3,496 of 3,860) improved in at least one food group.

- Mean dietary fiber intake increased from 10.8 grams to 15.6 grams/day (a 45% increase in intake); the minimum recommended intake is 20 grams per day.

- Intake of iron, calcium, vitamins A, C, and B6 increased substantially; all intakes were below 75% RDA at entry and above 75% RDA at exit (recommended minimum = at least 75% RDA).

- 91% of graduates (1,784 families) improved in food security and nutrition practices by running out of food before the end of the month less frequently, planning meals ahead, and using labels to choose healthy foods.

- 60% of graduates (1,177 families) reported increased frequency of choosing and preparing foods lower in sodium and fat, planning meals ahead, reading nutrition labels, and eating breakfast.

- 86% of graduates (1,687 homemakers) more frequently compared food prices, used a grocery list, and had enough food to last for the entire month.

- 72% of graduates (1,412 homemakers) began using recommended practices to thaw and store food safely.

- 62% of youth reported eating a variety of foods

- 60% of youth increased their ability to select foods that were both nutritious and low in cost

- 83% of youth improved their food preparation and food safety practices.

Among the 6,677 limited resource adults statewide who participated in the Smart Choices Nutrition Education Program (SCNEP) and the 3,065 adults that graduated after completing 8 to 10 lessons, the following impacts were identified:

- 46% of the limited-resource adults/homemakers (3,065 of the 6,677) met the nutrition objectives for graduation by improving their intakes of food groups in the Food Guide Pyramid and also of key nutrients (Vitamins A and C, calcium, iron, and fiber).

- 84% of adult SCNEP graduates (2,563 of 3,065 individuals) made substantial improvement in the number of servings from one or more food groups of the Food Guide Pyramid.

- Mean dietary fiber intake increased from 10.6 grams to 12.7 grams/day (a 20% increase in intake); the minimum recommended intake is 20 grams per day.

- Intake of iron, calcium, vitamins A, C, and B6 increased substantially, with intakes of all increasing by at least 10% from entry to exit from the program.

- 49% of graduates (1,502 families) improved in food security and nutrition practices by running out of food before the end of the month less frequently, planning meals ahead, and using labels to choose healthy foods.

- 87% of graduates (2,667 adults) reported increased frequency of choosing/preparing foods lower in sodium and fat, planning meals ahead, reading nutrition labels, and eating breakfast within two hours of getting out of bed.

- 82% of graduates (2,513 adults) more frequently compared food prices, used a grocery list, and had enough food to last for the entire month.

- 64% of graduates (1,962 adults) began using recommended practices to thaw and store food safely.

- 425 homemakers did some gardening, with their mean intake of vegetables increasing by one full serving per day. Those who did not garden increased their vegetable intake by only 0.5 serving per day.

Family and Consumer Sciences agents conducted 26 Applied Foodservice Sanitation courses (a 16-hour training) reaching 591 foodservice professionals. Five hundred and ten foodservice professionals (86.3%) obtained national certification by passing a National Restaurant Association examination.

Three hundred and twenty four (324) volunteer food handlers completed the Occasional Quantity Cook training. Fifty percent of course participants who completed a pre- and post-test exhibited a 25% gain in food safety knowledge.

The Serving Safe Food course (a 6-hour training) was successfully completed by 366 foodservice workers. This training increases knowledge/awareness of safe food handling and potential employment opportunities in the foodservice industry.

Master food preservation workshops were completed by 33 residents who will work with families in their local communities. A total of 47 pressure canners (pressure gauges) were tested for processing low-acid food.

The Virginia Department of Social Services requested 12,000 hand-washing posters to be distributed to all licensed and registered day care providers in the State.

Fourteen child care providers and nine youth learned the importance of personal hygiene during food preparation. As a result of the training, all participants adopted proper hand-washing techniques.

Starting A Food Processing Business conference was held at the Highland Center in Monterey. Seventeen potential and existing food business entrepreneurs received an 8 hour training on business plans, marketing, food processing, and food safety. Of the course participants, 92% reported knowledge gain in the areas of food processing and safety and pricing.

One hundred and seventy-three (173) individuals from family and community education groups, senior centers, and CommonHealth participated in the How Safe Are Herbs? program. Pre- and post-test assessment found 90% of participants had improved knowledge scores.

Funding and FTE's

Extension Funding

Year	Federal	State	Local	Other
2000	1,654,126	4,621,834	829,845	701,854
2001	1,703,750	4,760,489	854,740	722,910
2002	1,754,863	4,903,304	880,382	744,597
2003	1,807,509	5,050,403	906,793	766,935
2004	1,861,734	5,201,915	933,997	789,943

Research Funding

Year	Federal	State	Local	Other
2000	222,000	405,000	0.0	150,000
2001	229,000	418,000	0.0	154,000
2002	236,000	430,000	0.0	159,000
2003	243,000	443,000	0.0	163,000
2004	250,000	456,000	0.0	168,000

Extension FTE's

Year	Professional			Paraprofessional		
	1862	1890	Other	1862	1890	Other
2000	26.3	0.4	0.0	52.1	0.0	0.0

2001	21.0	0.6	0.0	85.0	0.0	0.0
2002	26.3	0.4	0.0	52.1	0.0	0.0
2003	26.3	0.4	0.0	*52.1*	0.0	0.0
2004	26.3	0.4	0.0	52.1	0.0	0.0

Research SY's Only

Year	1862	1890	Other
2000	2.1	0.0	0.0
2001	2.1	0.0	0.0
2002	2.1	0.0	0.0
2003	2.1	0.0	0.0
2004	2.1	0.0	0.0

Goal 4: To achieve greater harmony (balance) between agriculture (production activities) and (stewardship and protection of) the environment

Overview

Water quality, particularly as it relates to sediment, nutrient, pathogen, and chemical pollution of groundwater, streams, and waterways, is a major concern at both the State and national levels. In Virginia and other mid-Atlantic states, the restoration of the Chesapeake Bay has been a major area of focus since the mid-1980's. The Chesapeake Bay is North America's largest and most biologically diverse estuary, and is home to more than 3,600 species of plants, fish and animals. In June 2000, the states of Virginia, Maryland, Pennsylvania, and the District of Columbia signed the Chesapeake 2000 agreement, which established a partnership to further restore and protect the Chesapeake Bay.

Virginia Cooperative Extension educational programs on the conservation, protection, and stewardship of Virginia's land and water resources are conducted by Extension Specialists at Virginia Tech and Virginia State University, and by Extension Agents in 107 county and city offices. Water quality educational programs concentrate primarily on non-point source pollution in agricultural and urban and residential environments. In fiscal year 2001, Virginia Cooperative Extension Agents and Specialists made 116,338 face-to-face contacts related to water quality educational programs.

Many different strategies and applications of new technologies are necessary to accomplish the overall goal of achieving greater harmony between agricultural and forestry operations and the environment. Long-term field monitoring efforts will continue to be used to assess the effect of land use on both ground and surface water quality. Dependable information from such field studies is essential to develop best management practices (BMPs) which reduce non-point source (NPS) pollution. Over the years, many BMPs have been developed. Selected examples include the following: (a) integrated pest management, (b) animal waste control structures, (c) buffer strip cropping, (d) grass filter strips, (e) erosion, water control and treatment structures, (f) stream protection, (g) nutrient management, (h) storm water retention ponds, and (i) constructed wetlands.

Numerous factors such as land use, climatic conditions, soil conditions, and geographic conditions influence the effectiveness of BMPs. Appropriate procedures for evaluating BMPs must be developed. One obvious approach would be to conduct full-scale field studies to accomplish this goal. Small-scale studies with rainfall simulators have also been used to approach the same goal. These experimental approaches are generally expensive because of the time and labor involved. One cost-effective way of accomplishing the same goal is to use mathematical models to evaluate different BMPs. This approach has been used successfully in the past under different situations. However, the success of this approach will depend heavily on the availability of realistic mathematical models to represent the system. Therefore, efforts will continue to improve existing models and to develop new approaches.

Management of wastes from intensive production and processing facilities will continue to play an important role in advancing greater harmony between agricultural and forestry operations and the environment. While developing new and more effective management technologies, research on the utilization of this waste as a nutrient source for crop production and converting it into

revenue generating by-products will also continue. Research to minimize both the quantity and potency of waste through dietary changes in animal diets will continue.

A key principle of sustainability is to recycle renewable resources and minimize the use of nonrenewable resources. Modern commercial agriculture has been dependent on petroleum-based sources of nitrogen and mined and industrially processed sources of other nutrients to increase the fertility of its soils. Recycling of organic wastes onto soils may improve the soil chemical, physical and biological properties, which increase soil productivity and enhance environmental quality.

Major emphasis in recent years has been placed on teaching and encouraging farmers to utilize wastes as fertilizer. As profit margins stagnate, or become smaller, there is a need to develop treatment and handling alternatives that convert wastes into profitable by-products.

Odors from livestock farms often create major conflicts between farmers and their urban and suburban neighbors. Because of the likely odor conflict between livestock production and non-farming neighbors, zoning authorities are increasingly considering imposition of significant setbacks for large production systems from neighboring residences and developments. Farmers are often unable to meet these requirements, and are frequently hindered in assembling economically viable livestock growing operations because of possible odor generation. Methods of treating and managing agricultural wastes are needed to allow farming and other neighbors to satisfactorily coexist.

Producers of food and fiber must be educated to facilitate voluntary adoption of BMPs. This educational effort will be most effective if carried out through a variety of means including publications, which are an important mechanism for disseminating information. Media opportunities must also be utilized to the fullest extent possible. In addition, field days and innovative demonstrations are needed to get improved methods into practice. In order to gain initial participation, workshops, demonstrations, and field days will be widely advertised well in advance of the offering. Programs which allow a participant to “buy-in”, such as water testing opportunities and Farm*A*Syst, will be especially effective.

Federal, state, private and nonprofit agencies will be involved in the planing and implementation of projects. Such agencies will include, USDA's Natural Resources Conservation Service (NRCS), Virginia Department of Environmental Quality (DEQ), and Virginia Department of Agriculture and Consumer Services (VDACS). Internally, project objectives will be implemented in collaboration with Cooperative Extension and the Experiment Station. The NRCS provides expertise and material support in all phases of project implementation. State agencies such as DEQ and VDACS participate in prioritizing research, provide technical assistance and cooperate in developing research proposals.

Key Themes

Nutrient Management

As a result of Virginia Cooperative Extension educational programs in partnership with other State environmental agencies to promote the implementation of Best Management Practices to protect water quality, Virginia reached its 40 percent goal of reducing agricultural nitrogen and phosphorus loads in the Shenandoah/Potomac River Watershed.

In an effort to promote the movement of poultry litter out of the Shenandoah Valley to nutrient deficient areas of the state and alternative uses for poultry litter, Virginia Cooperative Extension arranged for Harmony Products, Inc. to demonstrate their granulated poultry litter fertilizer during the forest fertilization demonstration that was part of Virginia Tech's Fall Forestry Bus Tour. Approximately, 85 private forest landowners attended the demonstration. Several Bus Tour participants expressed interest in using the poultry litter product on their farms and tree plantings. One participant ordered enough poultry litter fertilizer to fertilize 3,000 acres of forestland.

Virginia Cooperative Extension disseminated information on proper rates of fertilizer and lime to use for optimum crop quality and yield with minimal potential for loss of nutrients to groundwater and surface water through soil samples analyzed and reports prepared by the Virginia Tech Soil Testing Laboratory. From July 1, 2000 through June 30, 2001,approximately 31,875 samples were analyzed for an estimated 7,970 farmers and agribusiness personnel.

For home landscapes, Virginia Cooperative Extension provided information on proper rates of fertilizer and lime to use for optimum plant quality and yield with minimal potential for loss of nutrients to groundwater and surface water through soil samples analyzed by the Virginia Tech Soil Testing Laboratory. From July 1, 2000 through June 30, 2001, approximately 10,625 soil samples were analyzed for an estimated 2,655 individuals and businesses in the non-agricultural sector.

Evaluation data collected by Virginia Cooperative Extension from participants in statewide lawn care/water quality education programs (14 VCE units) was recorded on an urban nutrient management Intranet tracking site by name, turf area, hydrologic unit, and actual fertilization practice. The database contains 1,729 different participants representing 402 acres of turf grass in 26 different hydrologic units. Participants used an average of 1.2 pounds of nitrogen fertilizer per 1000 square feet post program, and 0.5 pound of phosphorus fertilizer per 1000 square feet post program. Both fertilizer rates are well within VCE recommendations, thus greatly minimizing the potential for nutrient run-off. Pre- and post-test results from a sample of 702 participants revealed the following results:

Practice	Pre-Test	Post-Test
Was soil tested before lawn fertilized?	11%	99%
Cool season lawn fertilized in the fall?	42%	92%
Was lawn core aerated?	31%	62%
My lawn looks bad.	32%	9%
My lawn care practices impact the Bay.	50%	70%

These survey results indicate that homeowners can learn and implement recommended practices for water quality protection while at the same time achieving an attractive and sustainable lawn.

Virginia Cooperative Extension conducted 87 quick nitrogen soil sample tests, which represented 2000 acres of corn in Culpeper County. Results showed that 81 percent of the fields tested had sufficient nitrates present, and that additional applications were not necessary. Reduced water quality risks and financial savings were benefits of an educational program that producers now request.

Soluble reactive phosphorous (SRP) is considered a major contributor to surface water eutrophication. The Virginia State University (VSU)/ARS project "Chemical Fixation of Phosphorous in Manure Amended Agricultural Soils" attempts to identify characteristics of agricultural soils for their ability to retain phosphorous will help plan manure placement in environmentally sensitive agricultural soils in Virginia. Identifying these soil characteristics will allow for predicting the extent of phosphorous loss by erosion, leaching and overland flow ensuring farmers of the proper amounts of phosphorous to be place thus protecting the environment and water quality. Preliminary results of this study indicated that application of lime and alum either together or in sequence could serve as an alternative management practice for retaining manure SRP in soils. One referred journal publication was generated from research findings of this project. Additionally, two presentations of research findings were given, one at VSU Annual Agriculture Field Day, and one at professional society meeting in FY2001.

The VSU/ARS project "Development of Strategies to Use Farm Manures for Crop Production" addresses the heavy use of inorganic nitrogen fertilizers by Virginia farmers which also is harmful to the environment. In collaboration with USDA/NRCS and the Virginia Department of Conservation, this project study the use of alternative methods to reduce the application of inorganic fertilizers used for crop production. Litter produced by the large Virginia broiler industry is being combined with farm manures and organic materials. Experiments are being conducted to determine the suitability of organic additives, the most efficient composting methods, the economic feasibility of composting and practices that might enhance the quality of compost. This project is in its initial year of full implementation, and is progressing.

Through a cooperative education program conducted by Virginia Cooperative Extension and the Soil and Water District in the New Kent area, 4,580 acres out of 6,600 acres of wheat planted in 2000 was planted no-till (69%). In 1998 only 10 percent of the wheat acreage was planted no-till. A Rainfall Simulator study on continuous no-till grain production showed a 74 percent reduction in water runoff, 99 percent less sediment loss, 94 percent less nitrogen, and 92 percent less phosphorus losses compared to conventional-tilled wheat planting.

Virginia Tech scientists developed cost-effective management strategies to reduce the adverse effects of dairy farms on water quality. They demonstrated that there is real opportunity to reduce phosphorus losses from farms through improved herd nutrition, and are working to encourage acceptance of this technique. Computer prediction of nutrient accumulation on farms remains a promising approach. Educational programming has led to an increase in awareness of environmental issues among dairy farmers and their advisors within the state.

Riparian Management
As a result of Virginia Cooperative Extension educational programs in cooperation with the Farm Service Agency and the Virginia Department of Conservation and Recreation, over 4500 acres of riparian buffers have been approved to participate in the Conservation Reserve Enhancement Program (CREP) in Virginia.

As a result of a Virginia Cooperative Extension on-farm demonstration field day attended by 100 landowners, and reinforced by newsletters, newspaper articles, and personal contacts, 37 producers from Louisa and Fluvanna Counties enrolled in the 15-year Conservation Reserve Enhancement Program, which resulted in the installation of over 440 acres of riparian buffers.

Agricultural Waste Management
Virginia Cooperative Extension worked with 30 dairy farmers in Rockingham, Augusta, Franklin, and Bedford Counties, 25 members of the Dairy Environmental Stewardship Council, and 50 dairy industry professionals in the development and testing of methods for dairy producers to identify strengths and weaknesses in environmental stewardship on dairy farms and development of strategies to make dairy farmers aware of good environmental management practices. Approximately 25 producers, environmental regulators, agribusinesses, and Extension agents and specialists committed more than 254 hours to develop a dairy producer's environmental management checklist followed by delivering a six hour pilot educational program for 50 dairy professionals in support of disseminating this checklist to all dairy farms in Virginia.

Sixty operators of confined animal feeding operations received training through Virginia Cooperative Extension on proper operation and management of waste handling systems. This training was necessary for producers to remain in compliance with their Virginia Pollution Abatement permit. Also, it helped to prevent manure spills through preventative maintenance, and to minimize environmental damages in the event of a spill.

Water Quality
The effectiveness of nonpoint source pollution control efforts depends upon diverse farm economic and physical characteristics. Virginia Tech scientists developed an integrated watershed assessment tool to evaluate the water quality and economic impacts of alternative agricultural nonpoint source pollution control policies. The watershed assessment tool will assist decision makers in evaluating environmental impacts and costs to farmers and taxpayers of policy alternatives for water quality protection in watersheds where agriculture is a major source of pollution. Decision makers will be better able to select policy alternatives which maximize achievement of water quality protection goals at minimum cost.

Virginia Tech scientists conducted a study to investigate the impact of precision farming on the surface water quality and on crop production in the Atlantic coastal plains. The study results clearly demonstrate the potential environmental benefits of precision farming over the conventional farming systems. Precision farming could potentially be used as a best management practice to minimize the transport of nutrients to the Chesapeake Bay.

Through a Virginia Cooperative Extension education and research program on tracking sources of fecal bacterial contamination in ground and surface waters, the Virginia Departments of Conservation and Recreation (DCR) and Environmental Quality (DEQ) now require that fecal source tracking be used in all total maximum daily load (TMDL) projects in Virginia. These two agencies hope to perform 400 stream and 200 shellfish TMDLs over the next 10 years. The results of fecal source tracking are used to develop best management practices (BMPs) to reduce fecal loading into receiving waters and ensure that all Virginian's have access to the safest possible drinking and recreational waters.

In an effort to improve water quality, and provide a greater economic opportunity to Virginia dairy producers, a Virginia Cooperative Extension Dairy Agent was able to add a new dimension to the Dairy Loafing Lot Rotational Management System (DLLRMS) best management practice (BMP). He met with officials from the Department of Environmental Quality along with two dairy producers and explained the recommended design criteria and potential water quality benefit of proper housing structures when they are used as an alternative to traditional sacrifice lots in loafing lot management systems. After much discussion the Construction Assistance Program Director and Project Supervisor for the Department of Environmental Quality (DEQ) decided that a "loose housing structure that eliminated the need for a sacrifice lot" would be eligible for funding as part of a DEQ Ag BMP low interest loan (3%). This decision and action will result in a significant water quality improvement and economic opportunity for many Virginia dairy farms.

The promulgation of new confined animal feeding operation (CAFO) regulations by the Environmental Protection Agency (EPA) and the potential lowering of animal unit thresholds may unduly affect Virginia's dairy and poultry industry. In an effort to communicate these potential effects and the concerns of Virginia farmers to EPA, Virginia Cooperative Extension cooperated with the Virginia State Dairymen's Association and the Virginia Poultry Federation to organize a tour of 4 Shenandoah Valley farms for 7 EPA personnel. Although the impact of the tour is difficult to measure, improved communication, recognition, and increased understanding of Virginia farming by these EPA officials can only be beneficial as they consider new rules and weigh the potential impacts of these rules on smaller farming operations.

To address water quality concerns on Shenandoah Valley dairy and poultry farms, 41 farms in Augusta and Rockingham counties participated in a Valley Farm Water Testing program. As a follow-up to this program, the area Virginia Cooperative Extension Environmental Science Agent worked with a Rockingham poultry farmer whose poultry house water was high in fecal coliform bacteria. In trying to solve this problem, the following bacterial removal systems were evaluated: an ozonator versus a chlorine tablet dispenser, sediment filter tank, and hydrogen peroxide treatment. Through this evaluation and one-on-one discussion, the poultry grower installed the chlorine and hydrogen peroxide treatment and saved $3200. After installing the system, his bird performance and rank compared to other growers went from 12 and 14 on the list down to 3 and 4. The increase in bird performance and weight gain resulted in an additional $700 payout from the poultry integrator.

A Washington County farmer, through a Virginia Cooperative Extension household water-testing program, discovered that his family's drinking water was contaminated by bacteria and

nitrate, indicating that surface water was getting into his well. Through information provided in VCE's Farm*A*Syst Program, he was able to avoid costly water treatment equipment, and take inexpensive wellhead protection measures to successfully remedy the situation.

The VSU/ARS project "Removal of Pesticides From Plasticulture Runoff Using Vegetative Filter Strips" serves to determine the effectiveness of switchgrass and fall fescue filter strips in removing dissolved endosulfan and a cooper-based fungicide from plasticulture runoff. Vegetables grown using plasticulture is a large industry in the mid-atlantic and other regions of the U.S. This research provides quantitative data that will aid in the design of vegetative filter strips that can reduce insecticide and copper-based fungicide loads in plasticulture runoff. Producers will have a choice to use either grass or in combination based on their effectiveness thus protecting water quality. Two research referred journal publications were generated in FY2001 from this project. Two research presentations were made on research findings in FY2001 - one at VSU Annual Agriculture Field Day and one at professional society meeting.

The VSU/ARS project "Degradation of Atrazine and Metolachlor In Simulated Estuarine Sediment Water System" determined the effects of temperature and residence time on diffusion and degradation of 14C atrazine applied to the surface. The presence of atrazine in such waters is a concern, because the herbicide could adversely affect lake biota. Results showed that the potential impact of atrazine on aquatic plants associated with sediment would diminish with time because of dilution in the water phase, transformation to nontoxic products, and strong binding to soil particles. This project terminated in FY2000. However, final results reported in FY2001 produced two (2) referred journal publications from this research. In addition, two presentations on research findings were also made at professional society meetings in FY2001.

Integrated Pest Management

Twelve soybean farmers (8340 acres of soybeans) who attended the 2000 Essex Area Field Day conducted by Virginia Cooperative Extension completed a survey indicating that they scouted soybeans for corn earworm and used Extension's economic thresholds when deciding whether or not to treat fields with an insecticide.

Small grain producers in the New Kent area have been scouting their wheat fields for insects, weeds, and diseases for approximately 12 years. This correlates to the beginning of the Virginia Cooperative Extension Small Grain Maximum Economic Yield Club that was established in 1988. Out of the 6,600 acres of wheat planted in 2001, 100% was scouted for Cereal Leaf Beetles and only 15% of the acreage was treated. Sixty-two percent of the wheat was scouted for Powdery Mildew and only 3% was sprayed, while 71% was scouted for Italian Ryegrass with 29% treated. As a result of this educational program, routine calendar-based applications of insecticides has been eliminated.

Each year soybean growers face a destructive insect pest, the corn earworm, that attacks developing pods and reduces yields. A cooperative program among Virginia Tech, Virginia Cooperative Extension and Virginia State University, as well as many clientele volunteers, was initiated in the early 1990's to improve management of this destructive pest. The program provides annual predictions of pest abundance and issues weekly advisories that soybean farmers can use to help determine which fields need protection and when. This program has paid large

dividends over the years both in terms of cost savings to farmers, and overall reduction in insecticide use on Virginia farmlands. In 2000, farmers and their crop advisors used advisory information on more than 59 percent of the total soybean acreage to determine if enough corn earworms were present to justify insecticide treatments. As a result, statewide, only 6 percent of the total soybean acreage had to be treated for corn earworm, compared with 57 percent in 1999. This translated to an estimated 219,300 fewer acres being treated with insecticide, and at an average control cost of $10 per acre, an estimated overall cost savings of over $2 million.

Southern corn rootworm is an annual soil pest of peanuts. Larvae feed on developing pods causing direct yield loss and indirect damage by allowing entry of secondary plant diseases. Because it is a soil pest, scouting is difficult and many producers make 'preventive' soil insecticide treatments with no knowledge of actual pest pressure. A 'Risk Index' was developed by Virginia Tech and NC State University peanut entomologists that integrates factors that influence pod damage by rootworm, such as soil type, soil drainage class, peanut cultivar planted, and planting date. In the last 4 years, 1997-2000, only 2% of the farmers' fields evaluated (214 total fields examined) had any serious rootworm damage, and the Risk Index identified those correctly. For both states, peanut acreage treated for rootworm has gone from almost 90% in the late 1980's to an estimated 60%, and producers are maintaining peanut yields with lower insecticide use and costs.

Northampton potato farmers saved $110,000 in reduced chemical cost by following Virginia Cooperative Extension's Potato Blight Cast monitoring program, and saved $60,000 from reduced insecticide applications for European Corn Borer by following Extension's insect advisories.

Pesticide Application

As a result of developing new web-based content for clientele seeking answers to questions about training opportunities, procedures for certification, pesticide technical information, media for development of educational programs, and a desire to use web-based training, over 178,657 people visited the Virginia Cooperative Extension-Virginia Tech Pesticide Programs web site (http://www.vtpp.ext.vt.edu) in 2000 - an 18% increase over 1999. This resulted in 860,686 requests for 363,810 pages of information. The number of repeat visitors averaged 1,040 per month, with an average length of visit of one minute and 58 seconds. In addition, an on-line course in pesticide safety was offered through the Southern Region Pesticide Safety Education Center. The first course offered through the site enrolled 60 pesticide safety trainers and regulatory inspectors from 14 U.S. states, Canada, and Puerto Rico. A second course is slated for the fall of 2001.

In 2000, Virginia Cooperative Extension developed five crop pest management profile fact sheets on peanuts, snap beans, spinach, sweet potato, and tomato. These publications provided USDA with the means to develop transition strategies for farmers facing the regulatory impacts of the Food Quality Protection Act (FQPA). These fact sheets were published on the USDA Office of Pest Management Policy/Pesticide Impact Assessment Program web site. They are available for decision makers and the public alike to learn about the pest management needs of these and six other major Virginia crops.

Funding and FTE's

Extension Funding

Year	Federal	State	Local	Other
2000	1,194,104	3,336,471	599,060	506,663
2001	1,229,927	3,436,565	617,032	521,863
2002	1,266,825	3,539,662	635,543	537,519
2003	1,304,830	3,645,852	654,609	553,645
2004	1,343,975	3,755,228	674,247	570,254

Research Funding

Year	Federal	State	Local	Other
2000	2,585,000	4,072,000	0.0	1,458,000
2001	2,650,000	4,191,000	0.0	1,502,000
2002	2,716,000	4,313,000	0.0	1,547,000
2003	2,785,000	4,439,000	0.0	1,593,000
2004	2,856,000	4,568,000	0.0	1,641,000

Extension FTE's

Year	Professional			Paraprofessional		
	1862	1890	Other	1862	1890	Other
2000	54.8	0.6	0.0	1.6	0.1	0.0
2001	58.7	0.6	0.0	1.0	0.4	0.0
2002	54.8	0.6	0.0	1.6	0.1	0.0
2003	54.8	0.6	0.0	1.6	0.1	0.0
2004	54.8	0.6	0.0	1.6	0.1	0.0

Research SY's Only

Year	1862	1890	Other
2000	21.1	2.11	0.0
2001	21.3	2.11	0.0
2002	21.5	2.11	0.0
2003	21.7	2.11	0.0
2004	21.9	2.11	0.0

Goal 5: To enhance economic opportunities and the quality of life among families and communities

Overview

The quality of life for families, as well as the capacity of communities and local government to improve the quality of life for both children and adults in their respective jurisdiction, was enhanced during the reporting period of 200-2001 by programming efforts, accomplishments, and research provided by Virginia Cooperative Extension (VCE), representing the partnership and cooperation of both Virginia Tech and Virginia State universities. Indeed, farm families, rural and suburban families, and families of urban populations benefited from VCE's efforts to enhance economic opportunities and the quality of life for these citizens of the Commonwealth of Virginia.

Virginia Cooperative Extension's Agriculture and Natural Resources Agents (ANR) and Specialists conducted educational programs that helped sustain the profitability of agricultural and forestry production, while protecting and enhancing land and water resources. With this focus, programming efforts addressed a broad range of issues from traditional agricultural management and production in crops and livestock, to farm business management, soil and water conservation, land and water quality, safe use of pesticides, forestry and wildlife, and commercial and consumer horticulture.

Virginia Cooperative Extension's Family and Consumer Sciences and Community Initiatives (FCS and CI) programs, conducted by FCS & CI Extension Agents and Specialists, provided informal education that increased knowledge, influenced attitudes, taught skills, and inspired aspirations. Through the adoption and application of these practices, the quality of individual, family, and community life in Virginia was improved. During the reporting period, FCS and CI brought faculty expertise of specialists, agents, and volunteers together to address the needs and priorities facing Virginia's families.

During the reporting year, educational programs in these three areas reached nearly 1.2 million participants through a variety of delivery modes including conferences, workshops, home-study courses, web-based and other distance-delivered programs, public fairs, home/family shows, and exhibitions. Volunteer effort in support of the FCS & CI program involved 6,082 volunteers who contributed 59,568 hours of volunteer time.

Largely due to continuing collaborative programming with other state agencies, external funding support for the FCS program has reached $4.5 million. Nearly half ($2.7 million) of this amount is due to the continuing partnership between VCE and USDA's Food and Consumer Services with the delivery of nutrition education programs targeted at food stamp recipients (Smart Choices Nutrition Education Program). Another significant collaborative educational effort is the success of agents and specialists receiving grants from a special Virginia Department of Social Services collaborative partners program through Temporary Assistance to Needy Families (TANF) funding.

Virginia 4-H programs reached 634,554 youth through schools and clubs. Of these, 181,070 were enrolled as 4-H members, an increase of 28.8% from the previous year. Through a vast number of volunteers numbering 28,611, 4-H program efforts were supported and sustained. Volunteer commitment resulted in over 718,079 hours of volunteer time. Educational 4-H programs were delivered in context of 10 subject matter areas.

The Virginia 4-H mission, "*to develop youth and adults working with those youth to realize their full potential—becoming effective, contributing citizens through participation in research-based, informal, hands-on educational experiences,*" was fulfilled during the reporting year by utilizing the knowledge of the land-grant universities and the Cooperative Extension System to provide opportunities for youth and adults:

- To increase their desire to learn and to understand;
- To learn and practice democratic leadership skills;
- To contribute as volunteers;
- To experience and appreciate cultural diversity;
- To develop partnerships with families and communities;
- To learn skills that will better their future and the future of others; and,
- To become caring, competent, capable and responsible citizens.

The Virginia Agriculture Experiment Station research portfolio is conducting approximately 291 research projects dealing with agriculture related studies, human nutrition, foods, and gerontology. Of these, 28 are focused on agriculture related to improving the capacity of communities and families to enhance their own economic well being. Approximately 1150 public officials and community leaders participated in non-formal education programs on government and rural economic development issues during the reporting year. Virginia 4-H programs reached 634,554 youth through schools and clubs. Of these, 181,070 were enrolled as 4-H members, an increase of 28.8% from the previous year. 4-H volunteers numbering 28,611 supported and sustained the Virginia 4-H program. Volunteer commitment of 718,079 hours of volunteer time saved county and state government approximately $12,566,382 in funding. Virginia FCS & CI programs reached 294,718 adults. Volunteer efforts in support of the FCS & CI program involved 6,082 volunteers who contributed 59,568 hours of time. This saved county and state government approximately $1,042,440 in funding. Agriculture and Natural Resource programs reached 890,108 adults with 13,103 volunteers. These contributed 337,984 hours of time, thus saving county and state government approximately $5,914,720 in funding. All totaled, the three program areas saved county and state government approximately $19,523,542 in funding. During the reporting year, over 12,827 extended learners were involved in educational experiences that lead to increases in family knowledge, positive changes in family practices and behaviors, and individual and family participation in collaborative community activities. A total of 634,554 extended learners participated in non-formal education programs on youth development during the reporting year.

Key Themes

Adolescent Education and Positive Youth Development
95% of students participating in this year's tutorial program at Dupont Square Learning Center demonstrated improved grades during the 2000/2001 school year. Furthermore, 95% demonstrated improved reading and writing skills. "(My student) has demonstrated a great deal of growth in reading this year," Lisa Phillips, teacher, Falling Creek Elementary. And 100% of the teenagers who participated as Volunteer Teen Leaders during the 2000 Summer Program report greater knowledge of work skills.

95% of the students participating in this year's Cultural Exchange Project report a better understanding of other cultures as it relates to working together and developing tolerance. "I learned that if we work together, we can get a lot more done,"Sarith Ong, 16. "I enjoyed helping to plan the cultural exchange program," Vy Vong, 18.

Four one-hour workshops on "Time Management" reached 52 teenagers, 23 pre-teens and 7 special education students. Out of the 52 teenagers 39% (20) increased their use of a "Daily To Do" list. Out of the 23 pre-teens, 43%(10) stated they learned how to prioritize their responsibilities and obligations.

Seventy five percent of the 15 youth at risk participating in the Reaching Out for Teen Awareness program reported that they are better able to communicate their ideas to others as a result of participating in the ROTA program.

At the end of the six session Strengthening Families program, facilitators noted and all 20 parents and youth reported improvements in family interaction. One participant wrote "I learned to control my emotions better and cut down the arguing at home on a regular basis. I loved this program; it has made such a difference."

As a result of the Extension-sponsored Virginia Adolescent Resiliency Assessment being completed in two rural counties (597 students, grades 8-12, completed in 1999 and 2000), local coalitions have met to implement strategies to address identified issues. Utilizing the statistical base from the survey, monies were acquired to establish a semester-long class for students at-risk and provide training for three staff members to implement this program (approximately $8,500; salaries provided by the school system). One county has been recognized by the Office of the Governor for its work and has been selected as a site for the Governor's Right Choices for Youth initiative. A grassroots coalition in the other rural county is utilizing the survey results and working with the school system to develop a 21st Century Community Learning Center proposal incorporating broad-based programs to address issues identified in the V.A.R.A. Virginia Cooperative Extension personnel are actively involved in both counties and groups.

Animals and Human Development
Forty-two (42) human services providers participated in a Community Response to Prevention of Violence in Children Workshop. 73% (31) of the participants indicated on the workshop evaluation that they gained the most useful additional awareness and/or knowledge of domestic

violence from the lecture on Pets and Children in Violence. As a direct result of the workshop three (3) participants joined the Craig County Task Force on Domestic Violence Prevention.

Two Hundred Sixteen (216) citizens participated in a Public Forum on Animal Cruelty Laws Sponsored by WSLS-TV and VA PAWS at the Roanoke Higher Education Center. Increased awareness of The Link Between Cruelty to Animals and Inter-Domestic Violence was generated, As a result a coalition formed to submit a new bill to the State Legislature to increase the penalty for animal cruelty.

Child Development and Quality Childcare Education

As a result of the Quality Child Care Initiative in Chesterfield County 56 family day home child care providers increased their knowledge and skill level by participating in a home based business conference which focused on developing a business plan, starting a family child care business, record keeping, taxes, insurance basics, and family child care assessment skills.

459 participants attending Extension-sponsored child care provider training workshops gained knowledge and skills about nutrition and wellness, food safety, child development, age appropriate practices and resiliency. Pre-test scores (26% correct answers) and post-test scores (88% correct answers) document a 62% improvement in knowledge gain of the participants. Paired t-test was administered to detect statistically significant differences at the .05 level between the pre- and post-tests. The results indicated that a statistically significant change in child care training knowledge occurred in ten of eleven (91%) content areas a s a result of the educational intervention.

Family Night School is a program that helps children from immigrant families prepare for success in school and helps build a relationship between their parents and the school. In the fall 2000 and spring 2001 sessions of Family Night School, 100% of the parents from the 38 participating families reported gaining skills the help their children succeed in school. They also reported an increased understanding of and comfort with school services and personnel.

Eighty seven percent or 138 of the 159 participants in the Piedmont Child Care Providers Workshop reported knowledge gained "very much." Collectively they said they would share information with 682 persons. On written evaluations, forty six percent stated new learned skills they would implement. Some of these were: begin making puppets, gather books, use stress relieving techniques, use creative skills, use computer programs for children. Participants from fourteen units (seven outside of the planning district.)

One hundred-fifty child care professional have participated in fifteen educational workshops sponsored by Northamtpon County Extension. The educational topics included: healthy and safety, CPR and first aid, ages and stages, activities for the school-age child, cultural diversity, nutrition education and menu planning, record keeping, how to start and market your child care business, inclusion for the special need child, arts and crafts, story telling and drama in the childcare setting. The post evaluation indicated an average of 95% knowledge gained in the content area.

Extension programs conducted have enabled 15 new child care providers to establish businesses, resulting in an additional $1200 monthly added to the family income. This service has added over $18,000 in annual income to residents and has opened over 60 slots of quality child care to parents in the county.

Fifty-seven child care providers participated in sessions focused on what brain research tells us about infant care and what child care providers can do to enhance early brain development. Participants indicated on a scale of 1 to 5 (1=strongly disagreeing and 5=strongly agreeing) the following: Learned new information, 4.7; Information was relevant, 4.8; Will use the information now, 4.8; Will use the information in the future 4.9; Will use or refer to the handouts again, 4.7. Many of the child care providers indicated they would also use the information to educate parents of children in their care.

80% (32 out of 40) of the participants in the Caring for Children with Special Needs workshop reported an increase in understanding of working with children with disabilities. The day-long training was attended by child care providers, early childhood educators and employees of health department, community services board, and parks and recreation. 92% reported feeling more confident about caring for children with a disability.

91% (21 out of 23) of child care providers reported an increase in knowledge of health and physical activity issues in child care settings. The six hour training, For the Safety of Our Children was attended by child care providers and early childhood educators. All reported a minimum of one practice change they planned to implement to reduce the risk of injury or illness in the child care setting.

Based on extensive outcome measurements, 84% (60 of 72) of the children in the Craig County Child Care Center improved social/emotional development, cognitive and motor skill performance due to quality programming. With Extension providing the leadership, the child care services are provided by 12 staff persons contributing to family security and economic development of the county.

Of 177 participants in workshops to enhance quality childcare throughout a rural, 10-county region, 95% reported an increase in knowledge and skills relative to business practices, child development concepts and the need for focused activities. Six new family home providers established their businesses and two new centers gained licensure with assistance from the childcare program coordinator. The number of identified providers increased from 41 to 316 and one disillusioned provider decided to remain in the business after attending a workshop and discovering a support group of her peers.

Virginia State University facilitated eight Better Kid Care satellite downlink programs at VSU with 42 family home providers, child care center providers, and center directors on topics related to hot issues for Child Care Center Directors, Biting and Sharing, Pets in Child Care, New Ways to Plan Activities, Exciting Backyard Activities for Children, The Ups and Downs of Eating Times, and Celebrating Holidays with Young Children. 100% of participants reported that they had increased their knowledge of quality child care and planned to implement the quality care practices learned during the training.

Extension specialist from Virginia State University conducted training to FHD faculty on improving the child care environment and quality care criteria through the use of Early Childhood Environment Rating Scales, including the Family Day Care Rating Scale, The Infant-Toddler Rating Scale, and the School Age Rating scale. Primary focus was an understanding of the purpose and structure of the scale, introduction of the seven quality indicators, and 40 rating items of the scale. Practice observations and ratings of home care environments were provided through the use of videotapes. Agents reported this instrument as helpful in understanding important quality indicators in the child care environment.

Through Virginia Cooperative Extension, Virginia State University specialist conducted a program for twelve parents in King and Queen County on developmental delays of young children. Participants (100%) reported a greater understanding of what constitutes a developmental delay, the special education process, and procedures to seek screening and referral assistance for their children. As a result of parent empowerment, parent interest and needs during this session, the parents and the Family and Human Development Agent formed a parent resource center with a variety of reading material, fact sheets, and video tapes etc. One parent reported over 6 months later about the satisfaction derived from successful educational placement of her child through the use of procedures she learned during the session.

Virginia Cooperative Extension specialists from Virginia State University conducted a program for 55 parents and child care providers on Attention Deficit Hyperactivity Disorder at Fort Lee's Child Care Provider Conference. Participant needs included information on the cause of the disorder, symptoms, what to do if the child has received the diagnosis, how to access services for the child, and strategies for managing the ADHD child at home and at school. Audience participation was very high and 100% of the participants reported a greater understanding of ADHD and their intention to use one or more of the behavioral and procedural strategies that were learned during the session.

Extension specialists from Virginia State University provided leadership on a training team with Family and Human Development Agents to train 52 home and center providers in Petersburg and vicinity on Caring for Young Children With Special Needs. Topics included Introducing Inclusive Child Care, Getting to Know Children with Disabilities, Building Relationships with Families, including Young children with Disabilities in Daily Activities, and Community Services for Children with Disabilities. The participants reported an increase in their comfort level to care for special needs children.

Virginia State University has been conducting a program to prepare parents to operate day care centers. Participants complete a 12-week training program presented in four (4) modules with content in Child Development, Creative Activities for Young Children, Positive Management of Young Children's Behavior and Health, Safety, and Nutrition. Forty persons have completed the training and 12 are currently enrolled. Pre and post-test-scores reveal that participants made 55-80% gains in child care knowledge. As a result of the training, most participants have reported that they have gained self-confidence and developed a greater sense of self-esteem and self-worth. They add that the training has enhanced their ability to better organize themselves and their families for work and has helped them develop a strong work ethic.

Family Financial Education

At a "Credit Booth," on a local campus, students could receive information on smart credit practices and pay down schedule to pay off credit debt quickly and efficiently. Of the 19 students that received information on credit debt and risks, 3 students took plans with them that will enable them to pay their credit debt off, for a total savings of $1,500.

Extension provides Financial Literacy instruction to Individual Development Account enrollees. Eight of the ten have set goals and to date have saved $4,800 toward accomplishing them. The lead organization has reported that one participant has reached her goal of owning a home as a result of budgeting and saving practices, developed through financial literacy information. Since Extension became involved in the program in 1999, 61 participants have saved $22,503.40 and received match funds of $56,270.68 for a total benefit to participants of $78,774.08.

In June of 2000, programming for DSS welfare-to-work clients was conducted in Staunton/Augusta County. The topics covered were setting goals, budgeting, saving, and money saving tips. Forty-four percent reported that because of workshop, the one thing that they would like to do is "save more money."

The Managing Your Money (MYM) Home Study Course was conducted with 39 persons completing the final evaluation. Evaluations completed by the MYM participants showed the following: 52% had been threatened by a creditor, 21% had legal action taken against them by a creditor, 48% had cut-off notices or had utilities disconnected, and 26% were considering bankruptcy. Ninety-seven percent of the participants rated the MYM course as "helpful" or "somewhat helpful" in teaching money management skills. One hundred percent said they would recommend the course to others. The evaluations also showed the following: 52% plan to make changes regarding setting short-term goals, 67% plan to make changes regarding setting long-term goals, 78% plan to start a spending log to identify spending leaks, 57% plan to pay regularly into a savings plan, 68% plan to start using an organized record-keeping system.

Cooperative Extension is teaching families how to increase their savings and decrease their debts. Cooperative Extension at Virginia State University has been working with families in its immediate service area. One family's home had been advertised for sale because of foreclosure. Making the family aware of alternative courses of action at its disposal, Extension was able to intervene and help the family keep its home. Extension also helped the family prepare a five-year plan to get them out of debt and back on track. Another family had lost its income due to health problems. Extension was able to help the family document for its creditors the reason for its financial woes, their good faith intent to pay, and their previous excellent credit rating. Extension also informed the family of other sources of social service assistance available to them. Since then, the family has been receiving disability benefits and Medicaid support to cover its expenses.

Over 120 persons participated in a Cut Flower Growers Conference held at Virginia State University in March 2001. Through educational programs conducted by Virginia Cooperative Extension, a number of the farmers have adopted cut flower enterprise as a source of supplemental income. Many of these have been tobacco farmers, cash grain farmers and livestock farmers. These beginning cut flower growers sell an average of $5,000 of cut flowers

each year. A publication entitled Growing Everlasting Flowers: A Beginners' Guide has been distributed through Extension Offices across Virginia.

Twenty-two adults with disabilities (an underserved audience) learned tips and techniques on "Time Management" as it relates to keeping household records and paying bills on time. Through direct observation of the activities director who works with the adults on a daily basis, 50% (11 out of 22) are using at least one of the techniques learned from the one-hour workshop.

Fifty-four high school students participated in ten one-hour sessions on "Money Management Simulation". Through a daily log of skills learned, 35% (19 out of 54) reported they learned to correctly write a check, 57% (31 out of 54) learned about credit, and 55% (30 out of 54) learned to spell the numbers correctly on a check. Also, about 45% (24 out of 54) became aware of finance charges.

Six participants completing the Money 20/20 Program in the Chesterfield County Employees worksite education series followed through on recommendations and completed balanced spending plan and had debts analyzed. Each participant received a 'Zilch' debt reduction plan to accelerate debt payoff. Their average payoff time will take 3.17 years for a monetary savings collectively of $152,543 compared to $292,614 if the normal payoff method of paying debts is continued. Without these plans, payoff would require an additional 238 years for these debtors to become debt-free. In addition, 90% (37 out of 41) of adult participants continued to pay bills on time; 84% decreased expenses; and 63% begun or continued to save regularly. 87% rely less on overdraft protection on checking accounts.

Many families and individuals struggle with managing their personal finances, controlling outstanding credit and the threat of bankruptcy. To help youth avoid these traps, 287 students with the assistance of 5 teachers and 4 professionals improved their financial literacy through the NEFE High School Financial Planning Program (HSFPP). The HSFPP curriculum fulfills the SOL (Standards of Learning) requirements for the marketing and business classes including financial planning, career planning, budgeting, credit, savings/investments, insurance and banking. 85% of the students completing the pre & post test increased their scores by an average of 12 points. Students learned to write short-term goals, develop budgets and develop steps to meet their goals.

As a result of Extension Programs on debt management in the Middle Peninsula counties, 57 families have developed debt reduction plans that could save at least $5000 per family or up to 30 years on a family debt repayment schedule.

According to Norfolk Redevelopment and Housing Authority, 200 families living in public housing for one year showed an 85% success rate in paying rent on time for eight consecutive months because of their required attendance in financial management classes for new residents offered by Virginia Cooperative Extension.

23% of TANF participants (15 of 64) in Home Management program reported 3 months after completing programs that they were keeping better records and using a budget/spending plan;

20% (13) indicated they had started a savings account or were otherwise saving and had paid off some debts.

Agricultural Financial Management

Through a renewable grant from USDA, Cooperative Extension at Virginia State University implemented the small farm technical assistance and outreach program, which started in 1993. Currently, the program serves over 700 farmers in 43 counties. As a result of improved record keeping and financial management, approximately 35% of the participants who are Farm Service Agency borrowers are now able to secure direct and guaranteed loans themselves directly from commercial lenders. Since farmers have learned to prepare loan applications accurately, more are having loans approved earlier and have received monies in time to purchase supplies for the planting season. As a result of technical assistance to farmers during past five years, more than 80 loan applications have been approved totaling over $7.0 million. Records have been established for more than 70% of program participants.

Virginia State University's outreach and technical assistance program provided risk management education to more than 500 farmers, farm family members and landowners. Education strategies included workshops, distribution of risk management education materials and training through individualized farm and home visits. As a result, over half of the participants have adopted and/or indicate competence in implementing some form of risk management strategy to improve the financial, production, marketing, human resource and/or/legal risks they face.

Home and Housing Education

The Piedmont Housing Conference provided an opportunity for 66 persons to learn about housing options. Twenty-six (26) or 45% were a new audience to Extension. Ninety percent or 54 of the participants stated this workshop increased their knowledge of housing options and loans. Twenty six participants requested follow-up information in an on site tour of manufactured/modular homes.

Of the 175 persons attending Virginia State University's Southside Virginia Housing Conference in 2001, ninety-one percent said the conference influenced them to begin home improvement projects and three persons purchased homes as a result. Sixteen Home Maintenance and Repair Workshops were conducted last year. Of the 320 attendees, more than 45 percent said they made their own plumbing, electrical and heating system repairs, thus saving them thousands of dollars.

Eighty-eight families completed the homeownership education program and 58 bought a home within one year (66%). The County target is 60%. Seventy four families in mortgage default had their cases closed. Sixty-three of these families, or 85%, did not go to foreclosure. The county target is 75%.

60 people were involved in the 2001 Piedmont Housing Conference. 90% stated they would start a home improvement project as a result of attending the conference. Follow-up evaluations from the 2000 conference reported 18 have reduced their overall debt; 15 completed home improvement projects; 2 bought homes; 3 applied for home loans; 5 obtained credit reports; and 6 re-evaluated their homeowners insurance.

Four eight-hour training sessions on home ownership was conducted reaching forty-five participants. The Virginia Housing and Development Authority (VHDA) requires each participant to complete a before and with house budget fact sheet and take a test. These documents must be completed in order to receive a certificate. The certificate must be presented as part of the loan package. Three class participants have been granted a loan for home ownership as result of class completion.

Home Environmental Education

In the spring of 2000, conducted a program with Head Start parents in Highland County on lead poison. Sixty-seven percent said they planned to make a change related to preventing lead poisoning in their child, including having the child's blood tested for lead. One mother thought that her child was safe from lead poisoning, but after attending the program realized that her child spends a lot of time at Grandma's house and there may be a risk of exposure there.

72% (52) of adult participants completing the Chesterfield's Indoor Air Quality program to increase awareness of potential health problems reported they had followed one or more of the recommendations given in the workshop. 60% had taken action to restrict smoking to outdoors, away elderly and young family members.

Home-based and Micro-business Education

Ten of the eleven "Child Care as a Business" participants returned a 3 month follow up evaluation. Six reported making changes to their record keeping practices, two without a contract before the workshop had since included a written contract as part of their business, and three of those who had a contract made changes (which in one case was the inclusion of late and over time fees). Seven stated that because of the workshop they had included a new method of communication into their business practices and three made other changes due to knowledge gained.

In an effort to strengthen the infrastructure for tourism and provide farm families with information on options for additional income generation, a VA/KY Guest Lodging Conference was held for 35 participants with 95% indicating a high degree of satisfaction with program. One participant has established a Bed and Breakfast, one participant a cabin rental business, and a lodge operator has expanded his business.

Twenty-two adults participated in ten-week entrepreneurship training on "How to Prepare To Be Your Own Boss." Participants learned basic skills for starting and operating their own business. Twenty-five percent of the participants were already in business and wanted to sharpen their business skills. Ten percent started a new business. Participants develop a draft business plan and make presentation to the Small Business Development Center.

Of the approximately 68 individuals who have attended small business workshops, 76% (52) have utilized one or more techniques from the class to improve business skills in the 3 month evaluation follow-up. Eight new businesses had gone through start up as a result of the classes.

Two six-hour workshops on "The Business of Family Child Care: Taxes and Record-keeping" provided in-depth tax and record-keeping information to 11 participants. With an average pre-

test score of 40 percent and an average post-test score of 73 percent, the participants demonstrated an average increase in knowledge of 33 percent as a result of the training. A follow-up evaluation was mailed to 52 participants who had completed "The Business of Family Child Care: Taxes and Record-keeping: workshops between 1996 and 2000. Of the 18 who responded, 18 (100%) either agreed or strongly agreed that they now have a better understanding of a majority of the 10 content areas covered in the training. Thirteen (72%) of the respondents indicated that as a result of the program they had made at least one of the nine practice changes listed on the survey. Seven (39%) of the respondents indicated that as a result of the program they had made four or more of the nine practice changes listed on the survey. Fourteen (78%) of the respondents felt that the program had helped them reduce their taxes. Respondents indicated that they had saved an average of $1,500 on their taxes each year. When this figure is applied to all of the respondents who indicated they had save money on their taxes and multiplied by the number of years since receiving the training, the result is an estimated total of $73,500 in tax savings for these providers.

Working with Extension Specialist Ann Lastovica (VSU), offered two statewide "Family Child Care Taxes and Record-keeping" in-service training sessions for FHD and MHCE agents. A total of 27 Extension professionals received five hours of training. Twenty-two participants completed a pre-post test. With an average pre-test score of 37 percent and an average post-test score of 83 percent, the participants demonstrated an average increase in knowledge of 46 percent as a result of the training. In a six-month follow-up telephone survey, 11 (55%) of the 20 participants who responded has used the information. The nine (45%) remaining respondents planned to use the information in the future. The agents who had used the information had shared it with a total of 20 people individually, 322 people through newsletters, 110 people through short workshops, and 63 people through in-depth workshops.

Parenting Education

Thirty-one of thirty-five participants (89%) completed the "Families First - Keys to Successful Family Functioning" program and increased their knowledge of healthy family functioning by an average of 50% from pre-test (39% correct answers) to post-test (89% correct answers.) In addition, paired t-test were administered to detect statistically significant difference between seven knowledge gain pre- and post-tests of healthy family functioning and revealed that a statistically significant change occurred at the .05 level on all seven tests.

Fourteen court ordered parents completed "Positive Parenting" and eight-hour parenting class. Evaluations reflected a hundred percent increase in knowledge by acting more calmly using more kind words and natural and logical consequences with their children instead of using physical punishment. As a result there is more cooperation, understanding and less confusion, anger and tension in the homes.

Eighty Department of Social Services personnel participated in a parenting seminar focusing on utilization of enforceable statements, choices, natural and logical consequences and other limit setting techniques. The seminar was designed for participants to use the information personally or professionally as they work with parents. When surveyed 96% stated they gained new knowledge and 93% stated they planned to use one or more of the techniques.

Forty-four parents received 10 hours of parent education. Surveys indicated 100% learned new information and 88% reported trying a new parenting technique they had learned in the class. Of 26 parents surveyed 23 were able to give correct responses to five different behavioral situations 100% of the time. These parents were not familiar with the techniques represented prior to the class.

The "Becoming a Love and Logic Parent" curriculum continued to be delivered throughout Planning District 7 by trained volunteers. Volunteers contributed approximately 638 hours of time to the Love and Logic program. Nine parenting courses were offered in the Planning District with a total of 131 participants enrolled. Of the 63 participants completing the evaluation, 59 (94%) improved their knowledge, 57 (90%) made one or more practice changes, 42 (67%) indicated their children's behavior had improved, and 58 (92%) felt more confident about their ability to handle behavior problems as a result of the program. When rating how frequently they used six recommended child guidance strategies before the program, the respondents indicated that they used the practices an average of 62 percent of the time. When rating hour frequently they used these six recommended child guidance strategies after the program, the respondents indicated that they used the practices an average of 79 percent of the time.

In a 100% rural area, of the eighty-five participants in a series of parenting education sessions, 100% indicated an increased understanding of child development concepts as well as positive parenting techniques, 92% indicated an increased feeling of competence, and 100% reported increased skills to foster a child's positive development. In regard to the component on discipline, 100% reported a change in behavior matching expectations to developmental stages.

In a rural school district, of the thirteen participants in a workshop focusing on working with young children with learning disabilities, 100% reported an increase in knowledge of sources of support and educational resources available. Of the nine parents in attendance, 100% indicated a better understanding of the "language" of the IEP and four learned of local and regional services they did know about. 100% indicated an increase in understanding of strategies to help the learning disabled child with work and study habits.

Senior Adult Development Education

In two one-hour sessions, 16 Senior Citizens increased their skills in recognizing and avoiding telemarket scams and how to report fraudulent activity. Twenty percent (4 of 16) learned who to call for help in identifying fraudulent businesses. One participant was so excited to the information, she wrote that she wanted to "pass the info on to other people". Three participants wrote on the evaluation they were glad they did not have to feel guilty about hanging up on a telemarketing caller.

A program called "Lucy is Still Here" introduced 45 participants to the hidden problems of elder abuse. Forty-one participants completed a pre-post test. With an average pre-test score of 63 percent and an average post-test score of 74 percent, the participants demonstrated an average increase in knowledge of 11 percent as a result of the training.

Thirteen senior citizens, all over the age of 77, participated in a "Seniors Surf the Web" program. Since none of them had ever even touched a computer (or seen one up-close), 100% reported an increase in knowledge of the basics of computer use. They indicated feeling less "dumb" when folks talked about a mouse or keyboard or the web, and all indicate plans to visit the public library and "surf" to learn more. One of the participants was visually impaired and has plans to talk with someone to acquire a voice-sensitive computer with a Braille keyboard.

4-H At-Risk Youth Program

The 4-H mentoring program called Big Steps and Little Steps with 4-H met 3 to 4 times per month throughout the school year at Meherrin Powellton Elementary School. This program involved 9 mentees and 13 mentors. As a result, mentors ranked the overall success of the program as 3.3 on a scale of 4. On end of the year assessments teachers ranked improved self-esteem and exposure to new people/places/things as the biggest successes. Teen mentors cumulated over 1000 volunteer hours and a grant writer has be hired to expand this program to all four elementary schools in county during the 2001-2001 school year.

Virginia State University has developed vegetable gardens for inner city youth at three locations in downtown Petersburg, Virginia. The audiences, for this educational program, are youth-at-risk in low-income neighborhoods. The gardens are grown in vacant lots and on elementary school property. The children involved in these vegetable gardens range from seven to thirteen years of age. The kids have learned how to develop a plan for a vegetable garden, how to increase soil fertility through the use of lime, fertilizers and animal manures, how to plant seeds and transplants, how to control weeds by cultivation and through the use of mulch and how to harvest vegetables and prepare them for eating. The kids displayed some of their best produce in the youth horticulture exhibit at the Virginia State Fair. In 2002 the new emphasis of this program will be development of a roadside stand so the youth can gain experience in business and marketing. Eighty young people have gained education and self-esteem through this program.

An after school program that included bi-monthly meetings and field trips was conducted. After the first reporting period, tutoring sessions were also developed for students not succeeding academically. As a result, ten out of eleven students completing the year long program stated that the program helped them in making the transition from the elementary level to the junior high level. Of the 5 parents who completed the evaluation, 4 reported that the program benefited their child in the areas of self-esteem, adjusting to a new environment and improving grades. Only 3 teachers/tutors stated that the tutoring session helped improve grades. Two of the 11 did not improve with respect to discipline. Three students improved their discipline.

100% (9) of foster care youth in Richmond City who participated in the session on "Money Management" of the Real World, basic life skills, program learned how to manage money. They illustrated their knowledge gained by developing a monthly spending plan and how to write a check.

1,970 adolescent youth at risk participated in two after-school programs developed as a result the CYFAR grant. As a result of the program, 30% of the participants have improved their reading and study skills through the homework help center. 100% have reported passing to the next

grade level. Through cooperative activities, program staff reported that 20% of the youth participants have changed behavior and has been evident in the classroom. Parents reported that the after-school program provided a safe environment of their child. The second site was added this year as a result of the success and need of the first site.

95% of the 62 youth participating in "A Community That Cares" program started by extension agent and designed to help students who have been suspended from school for 10 days or less reported an attitude change towards school and themselves. 98% of the parents noted that they could see a difference in their child's attitude and behavior. This was due in part to Character Counts, conflict resolution, self-esteem building, alcohol and drug abuse training and other educational information taught to kids.

Twenty five at-risk youth (24 black, 1 white) participated in a college tour. The agent secured a grant to take borderline students to college campuses in Virginia and North Carolina. Of the twenty five at risk youth 55% of those youth who had not previously applied to college have been accepted for the fall term. The remaining students who's grades may have been borderline came back with a commitment to do better an enroll in community college if they were not accepted by a four year school.

Fifty-three percent (2,426) of 4,528 county youth participated in citizenship programs including, 4-H Character Counts: Me, My Family and Friends: My Government: Conflict Management and Conflict Resolution. There were 5,000 school youth who participated in a character building program "Winning Choices," in 17 of the 20 schools in Montgomery County. As a result of being a Character Counts participant, the youth learned the importance of being trustworthy, learned to respect others, to care for others, learned the importance of being responsible person, being a good citizen, and how to be fair to all concerned. As a result of the other at-risk programs conducted, the youth learned the importance of a good family life, in addition to learning how the local, state, and national government works.

100% of the population at Virginia Wilderness Institute (32 incarcerated youth who have committed non-violet offenses) participated in the program, "How to Get a Job", which prepared them for: choosing a career, locating job opportunities, job interview skills and expectations from an employer. Three volunteers assisted with the program which consisted of seven classes. 100% of the participants were surveyed and 100% expressed they had learned skills that would assist with their success in finding employment in the future. The administration at VWI has expressed the program met the needs of the inmates since many of them would be entering the job market immediately upon release.

4-H Camping

During the summer, a camp study was conducted for campers and parents of those campers. The results showed positive differences in life skill development from both the campers' and parents of those campers' perspectives. Outputs: On a scale of 1-5, where 1=poor and 5=excellent, youth ages 9-13 rated 4-H camp as 4.31; camp staff rated 4-H camp as 4.17; parents rated 4-H camp compared to other camping experiences as 3.96. Outcomes: On a scale of 1-4, where 1=helped me very little and 4=helped me very much, the campers ranked the two highest rated life skills of "making new friends" with 3.34, and "develop new skills in an area that I enjoy" as

3.25. Paired t-test analysis before and after camp on 24 different life skills items showed that parents believed that their child improved in the areas of “taking care of his/her own things,” “shares work responsibilities,” and “takes initiative and is a self-starter.”

In it's eighth year, the 2001 Family Camp at Holiday Lake 4-H Educational Center was attended by twenty-one families, comprised of 93 individuals. The first family camp began in 1994 with eight families and 34 participants. This intergenerational camp has grown and the revenue generated has increased over 200% since it's inception. Parent and child evaluations are positive, rated the camp experience as a 9.23 on a scale of 1-10 (1 being the worst and 10 being the best.)

Two hundred 4-H members developed a variety of life skills at the 2000 Amelia-Nottoway-Albemarle Junior 4-H Camp. Responses to the evaluation question, "What is the most important thing you learned at camp?" included: how to share and be friends with everybody, how to swim, teamwork, be all the time happy, how to canoe, to always watch what you eat in the forest, that you can make friends no matter what, be respectful, making new friends, be nice to each other, getting along, responsibility, friendship is important, how to be a good leader in C.I.T. Class, be nice to people and help them, how to live outdoors, treat others like you want to be treated, and to come back next year. Over 90% of the campers stated that they planned to attend the 2001 junior camp.

After attending a "Team Building" training at Airfield 4-H Center, twenty-two teen counselors and counselors-in-training stated that they became more aware and increased their understanding of working together in groups. In particular, one teen and his mother expressed a greater understanding of group cohesiveness and its importance for a successful learning experience.

90% of the youth who attended junior 4-H camp said that their experience away from home helped them to mature and become more responsible and said that they would apply skills learned back at home and in school. 98% of the teen counselors stated that their leadership skills were greatly improved and thought that the skills they learned would make them more responsible productive citizens in the future.

100% (40) of the teens participating as teen volunteers for Cloverbud and Junior 4H Camp said they felt a sense of pride serving as a volunteer leader and an insight into the importance of volunteering. 85% (125) of the 4Hers attending 4H camp said that they gained skills related to better understanding others and social skills during their camping experiences. 30% of these were high risk 4Hers.

The past year's impact of conducting two youth 4-H aquatics education day camps with Staunton River State Park has been very successful in addressing the concern of water quality in Virginia. Over 50 youth attended the camps from six Virginia counties. Eighty-seven percent (35 of 40) of the youth completing their questionnaire indicated they had learned valuable information regarding the effects of pH on aquatic living environments. Through collaborations with Virginia State University's Barry Fox, area 4-H agents, the Virginia Department of Game and Inland Fisheries 4-H Fishing Finatics program, the state 4-H Natural Resources and Environmental Education curriculum committee, and over 15 local volunteers, this program has been a success in educating youth to become productive stewards of the environment.

Six 4-H Center Program Directors were trained to use a new standardized 4-H camp evaluation process which will be implemented in summer 2001. The training included survey design, survey administration, data entry, and data management. Program Directors became familiar with this system and verbalized that it would help them to identify the impacts of Virginia 4-H camping. This process will allow Virginia to collect data on approximately 15,000 4-H camp participants. Two hundred 4-H teen counselors ages 14-18 participated in a 4-H camp risk management program. They learned about duty of care, liability, and negligence as related to providing 4-H camp programming. Participants demonstrated an increased knowledge of risk management principles and practiced methods for responding to 4-H camp risk management situations.

Seventy-five 4-H camp summer staff members ages 18-26 participated in the 4-H staff development event titled 2001 State 4-H Camp Staff Training. Staff members learned about: diversity, risk management/safety, camp programming, youth learning styles, and Character Counts! 67.5% of all participants indicated an increase in "awareness of the knowledge, skills, and abilities [needed] to become a successful 4-H Center staff member." One participant stated that the training "[reinforced] the importance of our roles in the lives of the children during the camp week."

An evaluation of 4-H members who attended Junior 4-H Camp was conducted with a scale of 1 equals "No" and 5 equals "Yes". The mean score for the question "Would you come back to 4-H camp next year?" was 3.94; for "Did you have fun at 4-H camp?" was 4.65; for "Did you enjoy your classes?" was 4.73 and for "Were teen counselors helpful this week?" was 4.69 In the same evaluation 94% of campers said that camp helped them "to make new friends"; 62% said it helped them "to become more responsible", 70% said it helped them to improve their confidence and 76% said it helped them "to learn more about different subjects". They also said that they were helped to "improve my leadership skills", to "improve my communication skills" and to "improve my ability to collect / present information". When asked, "What did you learn in your classes?" members answered a wide variety of things. These included "how to work as a team, believe in yourself, take care of animals, swim, ride horses and canoe; perseverance; trust; to strengthen my courage and to keep on trying when you screw up."

A new camp program that Bedford participated in this year was the 4-H Science Weekend, which was a cooperative effort of Campbell, Bedford and Amherst. It was a special weekend program for 3rd to 6th graders concentrating on the science and technology curriculum area. The evaluations showed that in addition to participants learning many things about science they also learned life skills. The percentage of participants who answered "yes, a lot" or "some" to "During 4-H Science Weekend I have learned to take care of my own things" was 84%, "to make new friends with people I don't know", 80%; "to be responsible for my own actions", 78%; "to be more interested in learning", 77%; "to use new information I have learned", 76% and "to set goals for my future", 74%.

The 4-H camping program, second largest in the nation, but the nation's leader in that it has all six facilities accredited by the American Camping Association, experienced another increase in numbers this year. The total number of campers for the year was 30,209 with 16,184 campers for the summer season. This represented an increase of over 8% from the previous year. Quality program standards and trained staff continue to be a priority of Virginia's 4-H camping program.

A total of 37 separate states have contacted our state 4-H department this year, seeking assistance of our 4-H camping expertise and experience.

Three Hundred Fifty 4-H youth, 33%, from 835 youth shown slides and presented information, attended Bedford's junior/intermediate camp. From an evaluation of their week at camp, 94% of these youth said they had made new friends, 70% that they had improved their self-confidence, and 53% said it had helped them see the world beyond their hometown.

4-H EFNEP/SCNEP

196 limited resource youth (23% of 851 youth) increased their knowledge of basic nutrition through. As a result, a pre/post survey was given to the youth. The survey measured the percentage of youth that eat a variety of foods throughout the day, their knowledge of food safety, their selection of healthy foods, and their practice of eating a healthy diet before attending the day camps and on completion of the day camps. The results were as follows (Pre Survey Post Survey): Eat a variety of foods 63% 65%, Knowledge of food safety 52% 70%, Select healthy foods 65% 87%, Practice eating a healthy diet 57% 83%

Six hundred and forty-five youth gained knowledge and skills by completing "hands on" workshops, making egg omelets, studying food safety and the food guide pyramid, taking more exercise and eating foods containing more of the chemical element Calcium. Fifty-seven percent reported improving their intake of calcium and sixty percent improved their overall physical well being.

In evaluating the 4-H EFNEP/SCNEP program, we are showing significant changes in dietary behavior change in all 3 evaluated domains (eating a variety, food safety practices, and selecting nutritious foods) to the P value of < .001.

4-H Program Delivery

VCE-Amherst 4-H and FCS staff presented two faculty In-Service workshops for middle school staff. Results of the pre- and post-test data analysis indicate that participants increased their character development knowledge overall by 47%, as pre-test scores increased from 35% correct answers to post-test scores of 82% correct answers. In addition, paired t-test, representing 92 cases, were found to be statistically significant at the .05 level of significance. The results indicate that a statistically significant change in character development knowledge occurred as a result of the educational intervention, due to the significant difference between the pre- and post-tests.

Fifth grade teachers reported a need for the American Chestnut Project for their students. A pretest revealed that only 14% of students knew that the tree was virtually wiped out by the Chestnut blight. After a series of 3 educational programs on the American Chestnut tree, 43% of students had increased their knowledge about the Chestnut blight fungus and its effect on the American Chestnut.

Twelve 4-Hers participated in the 2001 County Presentation contest. Of those presenting, 75% indicated that participation in the contest had influenced them to become more active 4-Hers. On

an even more positive note, over 58% of the contestants responded that preparing for the contest had helped them improve their communication skills and their self-confidence.

Virginia State University conducted Youth Aquaculture Program with more than 30 schools involved. Over 2,500 students participated in programs ranging from tours of the University's aquaculture facility to the establishment of fish production systems in public schools. A School Aquaculture Competition Award is given at the Virginia State Fair each year. A summer program for teachers to incorporate aquaculture into Standards of Learning in Virginia's Secondary Schools was provided.

All students in Roanoke County and the City of Salem school systems became involved in CHARACTER COUNTS!sm. Twelve middle school students were observed developing leadership skills, language arts skills, and public speaking skills as they developed and performed a series of skits to present the pillars of character to their peers (over 900 middle school students) and to the 1,768 elementary students in the system's 4 elementary schools. Evaluations of parents, visitors, judges, and participants indicate that the 4-H presentation program helps to prepare youth for many roles in life that include public speaking. Members indicate that it helps in organizing thoughts and information to present in such a way that others understand (communication skills development).

Annually, we survey the parents of all our 4-H club members to evaluate the effectiveness of our program. "4-H helped our son with organizing thoughts and ideas at the meeting." Another said, "I think the 4-H program is wonderful. As a leader, I can see the impact it has on the kids. They love it. In just one year I can see the difference it has made in my children's ability to interact with each other and help each other." Of the forty respondents: 85% indicated that 4-H had some/a lot of impact on their child's ability to understand self, 93% indicated 4-H had some/a lot of impact on their child's ability to communicate and relate to others, 88% indicated 4-H had some/a lot of impact on their child's ability to acquire analyze and use information, 85% indicated 4-H had some/a lot of impact on their child's ability to solve problems and make decisions, 78% indicated 4-H had some/a lot of impact on their child's ability to manage resources, and 90% indicated 4-H had some/a lot of impact on their child's ability to work with others.

Strong Families: Competent Kids is a program targeted at teaching children safety skills to use when they are home alone. In addition to teaching children, we send the parents a workbook to use with their family to discuss family choices. Parents of participants were surveyed to assess the impact of the program. Of the 88 respondents, 99% stated their children had a better understanding of rules concerning strangers, 93% stated their children knew what to do in an emergency, 91% stated their children knew constructive ways to avoid loneliness and boredom, and 91% stated their children knew ways to deal with fear. Fifty-five percent of respondents indicated that their family made changes as a result of the program.

Two hundred fifty Nottoway 4th graders gained new citizenship knowledge related to democratic elections and parliamentary procedure in their 4H in-school clubs. Forty developed leadership skills as 4H club officers. Nearly 90% completed one or more 4-H projects covering a variety of

subjects. Over 100 performed evaluated speeches and presentations in their club meetings, thus gaining self confidence and communication skills.

An After-School program was implemented at Ottobine Elementary School which included a 4-H program segment that was conducted 2 days a week being 30 minuets in length. Only those deemed as failing the S.O.L. test in Kindergarten, Third and Fifth grades were allowed to participate in the program. These grades and children were chosen due to the significance of the SOL tests and the school wanting to prepare these children for the tests using the 4-H SOL based curriculum. At the conclusion of the program 16 3rd grade students were asked a set of five S.O.L. based questions to see if they had retained the information taught. 50% were able to answer all questions correctly, 11% were able to answer some of the questions correctly, 35% answered the questions incorrectly and 4% were absent some of the days activities were done. It was later reported that one of the Kindergarten teachers at a staff meeting said that there are 66 children involved in the after-school program. Out of the 66 children involved the highest number of absences they had in one day was 3 children. The kindergarten teacher attributed the high attendance rate to 4-H's involvement in the after-school program stating that the kids were very excited and anxious to come.

One thousand eight hundred and twenty-one youth gained self confidence, poise, and public speaking skills, by participating in the 4-H presentation, share the fun and the 4-H public speaking contest. Sixty percent have improved their skills in organizing, collecting information, and have developed a sense of positive self-worth. Teachers of students who participated felt that their students had more interest in their subjects and were better communicators. Four hundred and forty-one youth participated in forestry judging, "The Water Wizard" Program, one outdoor environmental Fall Camp, and four outdoor classroom programs. Sixty-three percent of youth gained knowledge in water quality and environmental issues. Seventy-five percent improved their skills in tree identification.

90% (365 of 405) youth in-school clubs increased their knowledge by nearly 200%. Pre-and post-results showed that 80% (28 of 36) of 4-H'ers participating in the Breakfast Bites workshop gained knowledge of the Food Guide Pyramid. In addition, 20% reported that they changed to a low-fat cooking style. 98% (34 of 38) of 4-H'ers participating in Character Counts! training became more aware of how to become a person of character and adopted a more respectful lifestyle.

Administrators at Surry Elementary School in Surry County report that as a direct result of the implementation of the Character Counts Character Education program, the number of repeat discipline referrals was reduced to 3%. As a result of the 4-H Cloverbud program in Surry County, one parents comments that her children are more motivated to show patriotism, citizenship and respect to national symbols and government.

Twelve environmental education programs involving 1323 youth were conducted. Program topics included fishing education, aquatic science, watersheds, water resources, oceanography, non-point source pollution and field study techniques. Pre/post test evaluations indicated an average increase of 47% in knowledge and understanding of Standard of Learning objectives. Skills acquired included biological, chemical and physical stream monitoring; aquatic field study

techniques; best management practice application and watershed delimitation. Twenty-nine training workshops involving approximately 500 adults for a total of 130 hours were conducted. Topics included the Water Wizard Van, Projects Learning Tree, WILD and WET; water quality monitoring; field study techniques; general environmental and outdoor education; forestry and wildlife; and the Fish Banks computer game. Evaluations rated the sessions an average 4.6/5 and KASA pre/post tests indicated and average increase of 59% in subject matter knowledge and understanding. Evaluation comments strongly supported the need for more training (especially for teachers) with more outdoor, experiential components.

Of the 160 students who were who were taught the principles of public speaking, 100% reported they gained knowledge and improved their organizational skill. As a result 15% (24 students) participated in our local Public Speaking Contest the winners going on to participate in district contest winning blue ribbons.

46 4-H youth participated in the "Super Sitters", a six-hour baby sitting workshop. Each participant took a pre and post test. Test scores showed that the participants had an increase in knowledge with an average of a 12 point increase between pre and post test.

In 1999, from a random sampling of 644 youth in grades 4-7, the following occurred: 83% of youth doing presentations increased their skills in doing their homework; 86% increased their project knowledge; while 98% increased their skills in developing a main idea into step-by-step directions. More positive information was gleaned from this sampling to indicate that the program had great value for teaching life skills in preparing the youth for the future, as well as the present. In 2001, a comparative study noted an increase in the amount of information learned by the 4-H'er in all twelve questions asked. 85% of youth surveyed in 2001 (556 of 655) said that they improved their skills in organizing a specific topic and developing it into an organized oral presentation. 92% of youth surveyed in 2001 (602 of 655) noted the improvement. In conclusion, over a period of two years, youth continued to improve their speaking skills.

4-H horse projects are one of our largest enrollments outside of schools and camp. Hippology is the area where horse members learn the most. Bedford had several teams in each age category of our district event and in an adjoining district event. Because the district horse council decided to host the district hippology contest, a Bedford 4-H volunteer managed it because he is the council president. I was very involved in the conducting of the contest. The volunteer had been involved in hippology as a participant but not as the organizer of such an event. It was quite a learning experience for him. Nearly 200 participants were involved in the contest including participants from two other districts. A volunteer, from another unit, who did not carry through with their responsibilities caused us to have to develop one of the four parts of the contest in the last few days before the event. 78.5% of participants, volunteers and parents who completed evaluations felt the overall contest was excellent or good. When asked to name something they had gained from participation in hippology, answers included "knowledge of the horse; teamwork and cooperation; confidence; respect; patience and problem solving".

96 youth ages 8-11 participated in the 4-H Embryology Project in April and May. 84 eggs were placed in incubators for 21+/- days and 80% hatched into healthy chicks. 98%, of the 96 students

that participated, showed knowledge gained in life cycles in relation to these chicks as well as the responsibilities and care necessary to successfully hatch chicks.

157 youth participated in the 4-H marine science project on ocean life and ocean topography. 76% of those youth showed knowledge gained in the identification of 10 different species of ocean life and 6 terms used to describe ocean topography.

Through the 4-H delivery modes of 4-H Cloverbuds, Clubs, Enrichment Clubs, Project Clubs, and Special Interest Groups, and Camping, a total of 1,402,704 participants were reached through the 4-H program this year. Of this total, 140,518 youth between the ages of 5-18 were enrolled in the Virginia 4-H program. As part of the 4-H programming efforts, the 4-H program involved 1,567 children and youth and 81 adults in the State Strengthening sites and 104 volunteers contributed 15,222 hours of volunteer time to the program. Spanish speaking staff have been added in two of the four sites involved in this program. The focus of Virginia's efforts in working with youth who are at-risk is centered on the 4-H Youth Development Model: a relationship with caring adults; safe physical and emotional environment; opportunities to master skills and content; opportunities for service to others; opportunities for self-determination, decision-making, and goal setting; opportunities to be an active, engaged learner; a positive connection with the future; and, an inclusive atmosphere.

The Virginia 4-H/CHARACTER COUNTS!SM in the Commonwealth! focus included a total of 41,100 youth participated in this program in over 40 units' school systems and club programs. The first Virginia 4-H CHARACTER COUNTS!SM Awareness Conference was conducted in Roanoke for some 150 adult teachers, principals, superintendents, community leaders, and Extension agents. This event provided additional credibility to Virginia's 4-H program in its efforts to recruit and involve the community with the program. Additionally, the third annual 4-H/CHARACTER COUNTS!SM Train-the-Trainer event was conducted at the Northern Virginia 4-H Educational Center for 70+ adults. These trainers are implementing the program throughout their geographic area of the state.

The 4-H Virtual Farm attracted much attention and focus during the year. During the Virginia State Fair, over 17,000 participants actually worked at computer stations with the web-based program, and some 40,000+ folks saw the exhibits during the 13-day event. Additionally, numerous schools, clubs, and groups worked with 4-H Virtual Farm learning activities throughout the state. Through the 4-H Virtual Farm, youth experience a life that only two percent of the U.S. population currently enjoys-focusing on learning activities that deal with livestock enterprise through which they become aware of the science, math, and management skills needed to run a modern farm operation. This and other virtual projects are being developed to provide additional opportunities for youth to learn through the 4-H program.

Mini-Garden - About 50% of land in Washington County is used for agricultural purposes, yet a large percentage of our youth have no concept of the labor and science used in vegetable production. Many youth believe that vegetables simply come from a grocery store, and that they are fresh, frozen, or canned. They lack the true realization of the vegetable origin, which could have been their very own backyard. The Washington County 4-H program secured a grant for $300 from the Tennessee Valley Region Association. The grant money funded a program to

increase agricultural awareness among youth ages 5-19. 25 youth participated in the project that began May 4, 2000. Each 4-H member was given seeds, plants, and a project book during the first workshop. Evaluation of progress was taken during two separate garden visits. Of those youth, 100% correctly lined off their gardens into appropriate planting rows. 30% experimented with organic methods of pest control or fertilization, and 55% completed and turned in a project record book for competition.

A total of 151 Teens were enrolled as part of a recruitment campaign conducted in area high schools to register teens for the Senior 4-H program. As a result of this campaign, there was a 40% increase in attendance in monthly teen club meetings and an increase in teen involvement in other programs and activities. Our teen members are instrumental in our collaborating with other agencies and organizations and their youth activities.

247 third-grade youth gained awareness of the interrelationships between plants and soils (SOL 3.7) through participation in the 4-H Ready, Set, Grow project. Statements from teachers were: "It fit right in with our current S.O.L. studies." "Definitely plan to include this in our school science unit on plants. For math we plan on graphing the growth." (4-H) 65% (37 of 57) of the 5th grade students at Cooper Elementary School practiced behavior changes related to the citizenship project "Me, My Family, and My Friends" as evidenced by completed project record books.

58% (33 of 57) of the 5th grade students at Cooper Elementary School communicated that they had practiced behavior changes related to the six pillars of character in CHARACTER COUNTS!sm, as evidenced by completed project record books.

The Fun with Foods Workshops in Buckingham and Prince Edward Counties involved a total of one hundred and eighty-three participants (74% white, 26% black). Written parent and youth evaluations showed that youth not only learned the "hard skills" of using kitchen utensils and appliances, chopping, folding, mixing, measuring and sautéing, but they also learned the "soft skills" of following directions, listening, helping others, and taking turns.

One hundred and fifteen youth (41% white, 57% black, 2% hispanic) in Buckingham County participated in the 4-H Presentations Contest. Written evaluations showed that the majority of youth felt that they were better able to speak in front of a group (67%), gather necessary information and supplies (83%), organize their thoughts into a workable presentation (64%), teach others (85%), and they felt better about themselves because of doing the presentation (75%).

Fifteen 4-H members increased their knowledge of dairy youngstock management through participation in a 4-H dairy science special interest camp. One hundred youth increased their knowledge of dairy management practices through workshops and cow colleges. This knowledge prepared them to compete in judging contests, junior dairymen's contests, quiz bowls, and dairy shows. Pre- and post-test evaluations found that 92% of the participants (12 out of 13) in the 4-H/FFA Dairy Management Workshop increased their knowledge of dairy reproductive management practices including heat detection, timing of insemination, and sire selection.

4-H Volunteer Development and Management

Approximately 30 Extension Agents (4-H and FCS) and forty 4-H volunteers participated in "Managing Youth Behavior" workshops at the 2001 4-H/FCS Inservice and Spring 4-H Volunteer Leaders Association Conference. These workshop were designed to improve verbal intervention and environmental management skills related to youth behavior. Extension Agents at the 4-H/FCS Inservice rated the session 4.12 on a 1-5 scale, where 1=poor and 5= excellent. Several participants identified the workshop as the most useful aspect of their conference experience.

Approximately twenty adult volunteers participated in the 4-H staff development event titled 2001 4-H Outdoor Adventure Leader Training. Participants were trained in outdoor leadership, processing adventure experiences, outdoor gear/equipment, risk management/safety, program evaluation, and completed an overnight camping experience. On a scale of 1-5, where 1= poor and 5= excellent, participants rated the overall quality of the training 4.61 and the educational value of the training 4.50. Participants indicated that the greatest amount of increase in knowledge, skills, and abilities were gained in the knot-tying workshop and the evaluation workshop. One participant stated "having never backpacked, I found this course excellent with very competent and fun leaders. I learned so many new skills and have a better feeling about my abilities."

Over 200 teens and adults were provided training in various aspects of the 4-H program, including judging, managing a club, recruitment of members and volunteers, and parliamentary procedures. Other training sessions included time management, effective teen leadership, child care, social and group interaction, and above suspicion policy for camp and other programs. Programs were conducted by teens and volunteers to teach classes and projects to younger members as well as for their peers. Skills gained were time management, research, social interaction in group settings. Characteristic traits provided opportunities to interact, practice, and demonstrate the skills they learned.

The Leader's Association identified teamwork and leadership as a priority area for training with teens and club officers. Participation at Officer and Leadership Training increased 76% with the added support of the Leaders. Evaluations indicated that 4-H'ers learned "how to run a meeting, to listen to everyone's ideas, communication [skills], and to be a team player". The volunteers' skills increased significantly as a result of participation in the ropes course. Several leaders indicated they learned to "listen to everyone's opinion" and the importance of "trust".

Teen Volunteer Recruitment - The need for increased leadership and volunteer opportunities for teens was identified by the Washington County Extension Leadership Council and the 4-H Development Association. In an effort to address this need, teen 4-H members are recruited and trained to serve as judges, camp counselors, ELC members, and speakers during 4-H events. Involving teens in leadership type roles provides experiences for them to develop public speaking skills, responsibility, and ownership in the county 4-H program. As a result of their involvement 4-H'ers continue their membership into their teen years.

Funding and FTE's

Extension Funding

Year	Federal	State	Local	Other
2000	3,562,736	9,954,717	1,787,360	1,511,685
2001	3,669,618	10,253,359	1,840,981	1,557,036
2002	3,779,707	10,560,960	1,896,210	1,603,747
2003	3,893,098	10,877,789	1,953,096	1,651,859
2004	4,009,891	11,204,123	2,011,689	1,701,415

Research Funding

Year	Federal	State	Local	Other
2000	902,000	1,647,000	0.0	607,000
2001	929,000	1,696,000	0.0	626,000
2002	957,000	1,747,000	0.0	644,000
2003	986,000	1,799,000	0.0	664,000
2004	1,015,000	1,853,000	0.0	684,000

Extension FTE's

Year	Professional			Paraprofessional		
	1862	1890	Other	1862	1890	Other
2000	141.5	7.0	0.0	8.9	12.0	0.0
2001	136.9	4.8	0.0	30.0	12.0	0.0
2002	141.5	7.0	0.0	8.9	12.0	0.0
2003	141.5	7.0	0.0	8.9	12.0	0.0
2004	141.5	7.0	0.0	8.9	12.0	0.0

Research SY's Only

Year	1862	1890	Other
2000	8.8	0.0	0.0
2001	8.9	0.0	0.0
2002	9.0	0.0	0.0
2003	9.1	0.0	0.0
2004	9.2	0.0	0.0

B. Stakeholder Input Process

For many years, VCE had a network of county/city advisory committees which were expected to give input on programs and assist in issues identification. Inadequate attention was paid to the development of these committees, and their effectiveness began to erode. In 1994, VCE restructured its umbrella Virginia Cooperative Extension Leadership Council (VCELC) and developed a new system of local Extension Leadership Councils (ELC's) designed to be in place in every county and city cooperating on extension programs. Very specific guidelines and indicators of quality were developed for these councils to ensure that the citizens led the councils and provided the appropriate input on issues, program needs, evaluation, and funding of research and extension programs. These councils, under the umbrella of the VCELC, are critical to the ability of extension and research to design and direct their efforts to meet public needs. In addition to the state ELC and the local ELC's, program leadership councils for all three major program areas involve citizens and staff in more in-depth analyses of needs and program design.

The following is information on the groups which were active during the reporting period to ensure that extension and research receive adequate stakeholder input on issues, programs, and the use of federal formula and other funds:

Extension Leadership Councils

The formalized means through which Virginia Cooperative Extension (VCE) establishes connectivity with the grassroots of the state is through a partnership known as Extension Leadership Councils (ELCs). At the local level, this partnership represents the diversity of each county and city in which VCE exists as a resource, the programming focus of VCE (4-H/Youth Development, Family and Consumer Sciences, and Agriculture and Nature Resources), and other organized community entities, which are natural partners for VCE. This partnership works in primary, secondary, or equal ways with local Extension Staff to determine needs, establish program priorities, plan and implement solutions, identity and secure resources, market VCE and its programs, and evaluate and report program results/impacts to other appropriate stakeholders.

At the state level grassroots is achieved through the Virginia Cooperative Extension Leadership Council (VCELC). The partnership is composed of volunteer leaders who represent the 22 planning districts of Virginia, at-large members appointed by the director and administrator, all VCE District Directors, all chairpersons (or designees) of the VCE program leadership councils, (FCS, 4-H, ANR), the VCE Director (Virginia Tech), the VCE Administrator (Virginia State University), the designated VCE staff from both Virginia Tech and Virginia State University, the 1862 director of the agricultural experiment station, the 1890 director of research, the deans of the related colleges, and the director of governmental relations at Virginia Tech.

Currently, 107 of Virginia's 108 units report having an organized ELC. In 2001 all the Extension Agents with primary responsible for the functioning of the local Extension Leadership Council and the Chairs of each of the organized councils were surveyed to determine how local councils were functioning. The results of the survey indicated that
of the 96 reporting, there is an average of 17 members to each council, thereby representing a total of 1,632 ELC representatives involved in the programming efforts of VCE. Sixty percent of the 96 reported they meet at least four times a year, indicating that periodic and consistent

contact is occurring to achieve grassroots involvement. The survey results also indicated that committee structures were in place to involve ELC members in all three programs areas of VCE. Of the 52 ELC chairs reporting, 33% indicated they recognized the diversity of representation on local councils as a strength.

The VCELC met 4 times in 2001-2002, with average attendance of members at approximately 35 members per meeting. The meetings provided a significant opportunity for volunteer members to communicate to the administrative and program leadership of VCE the issues/concerns and activities of the local ELCs they represent. The meetings also served as a significant forum for VCE's administrative and programming leadership to collect grassroots' input in the programming and administrative function of the organization. The VCE director and administrator met 4 times during this reporting period with the lay officers of the VCELC to ensure that meeting agendas reflected the collective view of the membership and to determine actions and decisions that the membership's involvement would be sought.

Virginia State University Leadership Council

The School of Agriculture at Virginia State University is finalizing plans for establishing a Leadership Council. The Leadership Council will provide advisory support for the total land-grant mission, including teaching, research, and extension. The membership will consist of statewide representation of clientele, faculty and other professionals. The council will create an avenue for obtaining stakeholder input through open and regular dialogue between it and the School of Agriculture. Several individuals have already been identified and asked to serve on the council, which will meet twice each year. Members of this Council will also be represented on the Virginia Cooperative Extension Leadership Council.

Agriculture and Natural Resources Leadership Council

The Virginia Tech College of Agriculture and Life Sciences Leadership Council formed an ANR Council in July 1999. The ANR council functions as a sub-group of the College of Agriculture and Life Sciences Leadership Council. The Council assisted in the identification and description of critical short-term, intermediate, and long-term agricultural issues facing Virginians. The Council considered current and planned ANR extension and research programs, funding, and structures and made recommendations on the needs of industry, producer and consumer clientele.

Family and Consumer Sciences Leadership Council

The Family and Consumer Sciences Leadership Council provides vision for the Virginia Cooperative Extension Family and Consumer Sciences (FCS) program and develops strategies which lead to the fulfillment of that vision. The FCS Leadership Council identifies statewide problems, issues, and concerns; assesses current programs and decides on the prioritization of program resources including funding; creates and monitors a strategic plan; explores opportunities for cooperation and collaboration; and monitors and reports program outcomes to appropriate public and private partners.

The Extension Family and Consumer Sciences Leadership Council met three times in the past year. Accomplishments included: sponsoring a statewide conference for program collaborators; providing leadership and direction for new program initiatives; creating marketing strategies;

and, identifying new program partners. The Council has recently initiated a strategic planning process that will produce a three year plan for the state Family and Consumer Sciences program.

4-H Leadership Council

The Virginia 4-H Leadership Council, consisting of 32 members, was created in 1994. It represents the diversity of the state's 4-H program and includes all major stakeholders. The members are recruited and selected to represent the six Extension Districts in the state and each major group of stakeholders, including District Directors, agents and volunteers. At-large members are also on the Council. At the November 1999 meeting Council members were given a map that showed the location and ethnic diversity of the council body. During the reporting period, the Council met four different times. The Council is divided into three active working groups: Policy, Emerging Issues, and Marketing. The Policy Committee reviewed eleven (11) 4-H Policies and established recommendations for changes, and modifications to the 4-H Cloverbud program as it relates to goats. The Emerging Issues Committee addresses many issues identified by the Council; such as, mid-term review of the Strategic Plan, relationship between the state 4-H program and the 4-H All Stars, Intermediate Age Programming, and relationship with the State Fair. It also explored and put into place a Leadership Institute for 4-H teens at State 4-H Congress. The Marketing and Public Relations Committee developed a plan to promote National 4-H Week Events, the Centennial Celebration of 4-H, the 4-H Alumni Search, and promotion of 4-H with 30-second PSA's. It also reviewed and recommended modifications to the "4-H For Life" magazine, promotions at the State Fair and other public places, and purchased and distributed 4-H promotion items. The Council's activities help shape educational programs that meet the needs of the youth of Virginia.

Local Government Reports

County and city governments differ as to how they prefer to receive reports on extension programming efforts in the localities. Some local governments prefer written reports, which are reviewed by the elected governing board members. Others prefer that the agents attend board meetings on some periodic basis. When this occurs, the reports are presented in the public board meeting where the public is invited to attend and comment.

Annual Public Hearings

The Virginia General Assembly conducts annual public hearings on the proposed state budget on a regional basis. Members of the public are invited to comment on any aspect of the budget, including extension and research budgets. VCE distributed information about the hearings and, along with the local ELC's, encouraged attendance and arranged carpooling for attendees. All clientele, including 4-H youth and under-served and under-represented audiences, are encouraged to attend. Several Citizens attended the January hearings on behalf of VCE.

College of Human Resources and Education

Stakeholder input through advisory boards continues to be a major emphasis of the College of Human Resources. In the past year, two additional advisory groups have been added bringing the total to 21. Total citizen members exceed 300 and include individuals from a wide spectrum of backgrounds and areas of expertise. Each board met at least once in the past year, with most meeting more often.

College of Natural Resources
The College of Natural Resources (formerly Forestry and Wildlife Resources) maintains an active, external Advisory Council consisting of representatives of a wide variety of companies, state and federal agencies, non-governmental organizations, citizens and others central to the mission of the College. The Council has 60 members and met formally on campus once this year. During the two day meeting the council met in smaller committees, eg. forestry, fisheries, wildlife, forest products, and natural resources recreation. Other committee meetings, both formal and informal, have occurred throughout the year.

The Advisory Council provides the College administration and faculty advice and guidance in such areas as curriculum development and improvement (both undergraduate and graduate), research needs and quality of our research programs, and extension programs and impacts. The college provided an annual report to the Council at its annual meeting held in March. They reviewed the progress for the past year and made recommendations for next year.

College of Agriculture and Life Sciences Leadership Council
The college council membership is composed of 82 individuals in 2001, external to the University, invited by the Dean. The purpose of the council is to establish open and regular communications between the college and the council and mutually understand the programs and activities of the college and the needs and aspirations of the professions and citizens it serves. The Council meets twice a year (January and July).

In January 2000, the Council's 21-member Research Committee studied the five main goals as well as the various sub-topics as they related to how the Virginia Agricultural Experiment Station might invest its resources. Then in January 2001 the State Extension Leadership Council reviewed VAES' investment in the five goal areas and suggested levels of variable investment across the five goal areas. Finally, VAES scientists were asked to estimate their actual investments in the goal areas. Data collected are as follows:

Goal No.	Actual VAES Investment*	Research Stakeholders**	Extension Stakeholders**
1	46	40	38
2	17	15	16
3	6	14	14
4	22	20	19
5	9	11	13

* Percent of projects having activities dealing with each goal area.
**Suggested percent of projects having activities dealing with each goal area.

The results indicated that a somewhat lower effort should be put into agricultural systems work (Goal 1) and more effort into a healthy and well nourished population (Goal 3) as well as more efforts in the area of enhancing economic opportunity (Goal 5). The stakeholder groups appeared to agree with the current investment of VAES activities in a safe and secure food/fiber system (Goal 2) and protecting natural resources and the environment (Goal 4).

VAES is working with its stakeholders to interpret the range of opinions as to how the Station should invest resources in the various goals and sub-activities.

Agriculture Industry Boards

Various commodity boards and other groups fund research projects annually on a competitive basis. This process provides valuable input to researchers about the focus of research efforts via the producer (stakeholder) input. The boards are "self-help" groups created by state law within the Virginia Department of Agriculture and Consumer Services for the purpose of promoting research, education and marketing efforts. The boards use funds generated through assessments that growers and producers of these commodities have agreed by referendum to pay for programs and projects that would benefit their commodities. Two board programs are funded either by licensing fees or a portion of revenue collected in taxes. Members of most of the boards are appointed by the Governor from recommendations made by the various industry groups.

Research projects funded by the Virginia commodity boards are as follows:

Virginia Commodity Boards	No. of Projects	Funds Awarded in 2001
Corn	5	$51,360
Horse	1	$9,875
Peanut	10	$171,410
Small Grains	12	$108,963
Soybean	7	$64,049
Cotton	7	$24,109
Apple	1	$5,222
Beef	1	$13,500
Bright Flue-Cured Tobacco	6	$29,000
Dark-Fired Tobacco	1	$3,500
Pork	5	$13,000
Winegrowers Advisory	7	$146,423
Egg Commission	1	$11,612
Sweet Potato	2	$4,828

The Sheep, Irish Potato, and Cattle Industry commodity boards did not fund any projects in 2001.

Additionally, the Virginia Agricultural Council was established by the General Assembly to provide a mechanism for financing agricultural research, education and services. Funding comes from assessment levied on certain agricultural supplies used by farmers. The Governor appoints 18 members of the Council who represent a wide range of farm commodities. Research and extension personnel applying for these funds, likewise, are provided valuable stakeholder input during the competitive awards process. The Virginia Agricultural Council funded 32 projects at Virginia Tech in 2001 totaling $344,925.

C. Program Review Process

No significant changes have been made in the program review process.

D. Evaluation of the Success of Multi and Joint Activities

In 2001, input was gathered from multistate Extension and integrated activities project leaders through a questionnaire they completed on the success of their projects and programs.

Issues addressed through multistate Extension and integrated activities were very much driven by input from various stakeholder groups. In most cases, projects and programs regularly include some combination of research, Extension, industry, and government agency input and active involvement through regular meetings and groups/boards. Many of these are collaborative in nature, rather than just advisory. Project leaders stated that this input is very important in identifying high priority issues and in shaping research and educational responses. As one project director stated, "This enables us to formulate strategic responses to critical issues."

Project leaders also felt that their efforts to include input from a broad representation of stakeholder groups also enhanced their ability to be inclusive of underrepresented and underserved populations and their needs. In most cases, project leaders were sensitive to this issue and indicated that their process for developing their project and programs was open to incorporating input and needs from underrepresented and underserved populations. In addition, many of the project leaders indicated that their projects and programs were developed to address all levels and types of audiences, which would include underrepresented and underserved audiences.

The extent to which projects and programs described expected outcomes and impacts and resulted in improved effectiveness and/or efficiency varied by the nature and maturity of the effort. In some cases, goals and objectives, which included outcomes and impacts were identified by the stakeholder groups involved in the process. These were monitored throughout the lifecycle of the project or program, typically through annual project and program reviews. Project outcomes and impacts were typically documented in annual and periodic reports, journal articles, and publications written on the project or program.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution Virginia Polytechnic Institute and State University
State Virginia

Check one: X **Multistate Extension Activities**
____ **Integrated Activities (Hatch Act Funds)**
____ **Integrated Activities (Smith-Lever Act Funds)**

Actual Expenditures

Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
1. To achieve an agricultural production system that is highly competitive in the global economy	**$296,000**	**$330,000**			
2. To provide a safe and secure food and fiber system	**14,000**	**26,000**			
3. To achieve a healthier, more well-nourished population	**14,000**				
4. To achieve greater harmony (balance) between agriculture (production activities) and (stewardship and protection of) the environment	**149,000**	**155,000**			
5. To enhance economic opportunities and the quality of life among families and communities	**9,000**	**10,000**			
Total	**$482,000**	**$521,000**			

J. David Barrett
Director

2/25/02
Date

Form CSREES-REPT (2/00)
Note that the approved target of 7% was attained.

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State Virginia

Check one: ____ **Multistate Extension Activities**
____ **Integrated Activities (Hatch Act Funds)**
__X__ **Integrated Activities (Smith-Lever Act Funds)**

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
1. To achieve an agricultural production system that is highly competitive in the global economy	**$390,000**	**$499,000**	_____	_____	_____
2. To provide a safe and secure food and fiber system.	**50,000**	**129,000**	_____	_____	_____
3. To achieve a healthier, more well-nourished population	**17,000**	**16,000**	_____	_____	_____
4. To achieve greater harmony (balance) between agriculture (production activities) and (stewardship and protection of) the environment	**142,000**	**166,000**	_____	_____	_____
5. To enhance economic opportunities and the quality of life among families and communities	**90,000**	**17,000**	_____	_____	_____
Total	**$689,000**	**$827,000**	_____	_____	_____

J. David Barrett
Director

2/25/02
Date

Form CSREES-REPT (2/00)
Note that the approved target of 10% was attained.

Brief Summaries of Multistate Extension and Integrated Research and Extension Activities (Smith-Lever Act Funds)

Based on the definitions of Multistate Extension and Integrated Research and Extension Activities (Smith-Lever Act Funds), the mixed nature of faculty research and Extension appointments, and the overlapping activities in these areas carried out in Virginia, it was difficult to separate the descriptions into the two categories. Therefore, they are reported collectively in this one section.

Goal 1: To achieve an agricultural production system that is highly competitive in the global economy

Pasture based Beef Systems for Appalachia
Other states involved: WV, USDA ARS
Brief description: This is a long-term project involving developing pasture-based beef production systems from calving through finishing and, ultimately, retail. Production systems investigated include heifer development, cow-calf grazing, stocker-backgrounder and finishing systems. Development, feasibility and marketing of a regional pasture-finished beef product is also being investigated. Transfer of the technology developed by this project is also a project goal.

NCR-87 Beef Cow-Calf Nutrition and Management Committee
Other states involved: OH, IN, MI, IL, WI, MN, IA, MO, ND, SD, NB, KA, OK, CO
Brief description: Committee objectives are: To continue the exchange of ideas, data, information and research techniques in a cooperative, interdisciplinary effort among stations to maintain an environmentally and economically sound beef cow-calf industry through integrated resource management. More specifically: 1) The development of data bases regarding feed composition values and nutrient requirements of beef cows, heifers and calves to validate and improve models used in the 7^{th} edition of the Nutrient Requirements of Beef Cattle for diet analysis in beef breeding herds. 2) The development of cow-calf production systems and heifer development programs that promote the efficient use of feed, labor, and economic resources through the management of reproductive cycles, weaning age, lactation and/or growth. 3) The development of integrated, year-round feeding management systems that utilize forages and other feed resources to optimize reproductive efficiency in beef cows and heifers at minimal economic or environmental costs. Areas in which publications will be prepared are: 1) Use of the NRC Nutrient requirements for Beef Cattle model for balancing cow, calf and heifer rations with common feedstuffs, and 2) Management of early weaning systems for beef calves.

The Wheat Industry Resource Committee (WIRC)
Other states involved: Potentially all states with wheat production, approximately 22.
Brief description: The WIRC is an ad hoc multidisciplinary structure. Extension specialists and researchers who work with the wheat industry have formed this alliance to share information on a continuous basis, and where appropriate to form partnerships for greater research or education efficiency. This group works with, and through, the National Association of Wheat Growers and has historically used the national convention and their summer workshop as an opportune time for interacting with the industry. In 1996, a Research and Education Forum modeled after the

Beltwide Cotton Meetings was suggested that would provide a base for sharing information, interaction with the producers and processors, and enable a structure by which faculty could get recognition for research and extension articles being presented and shared. The first Forum took place in January, 1998 with a published proceeding. Since then the Forum proceedings have been made available on the internet, and accessible via the NAWG website.

US Wheat Quality Council and Technical Boards
Other states involved: Potentially all states with wheat production, approximately 22.
Brief description: These are industry lead and funded and meet once a year to review outcomes from the public and private wheat breeding programs and to share other relevant public and private research that affects the wheat foods supply chain. Representatives from the public sector involve breeders from the Land Grant Universities as well as the ARS regional research locations, and a few production specialists.

Annual Soft Wheat Research Review: ARS Wooster, Ohio
Other states involved: Potentially all states with wheat production, approximately 22.
Brief description: This annual review is a collaborative outcome of ongoing projects between ARS and Land Grant University researchers and educators who work with the soft wheat industry. The subject is broadening to include hard type and soft white wheats as these genetic lines are being tested in the traditionally soft wheat production region. The scientists located at the Wooster site involve both ARS and Ohio State University faculty, and are collaborators in research on wheat industry decision support models.

Regional Project NC-213 Production, Marketing and Delivery of Quality Cereals and Oilseeds
Other states involved: Potentially all states with wheat production, approximately 22.
Brief description: The mission of the NC-213 is to foster interdisciplinary and interregional partnerships that will assist all sectors of the grain industry to preserve and enhance the quality of U.S. cereals and oilseeds. Identifying, preserving, and closely matching grain quality with specific end-user needs promote economic growth and global competitiveness. Participants represent bio-engineering, entomology, pathology, grain science and industry (Kansas State U.), crop science, and USDA-ARS. This regional research group has strong links with industry, and has an established endowment from the Andersons (grain industry) which funds administration of the project and approximately $100,000 per year in research projects, plus a new endowment team research project.

Development and Implementation of a Risk Index for Reducing Insecticide Use for Control of Southern Corn Rootworm in Peanut
Other states involved: NC
Brief description: Southern corn rootworm (SCR) is an annual soil pest of peanut in VA and NC, and an occasional pest in SC, GA, OK and TX. Larvae feed in the soil on developing pods, which reduces yield, and allows entry of secondary pod diseases that affect nut quality. Because it is a soil pest, detection is difficult and many producers make preventive soil insecticide treatments with no knowledge of actual pest abundance. Project research showed that much of the peanut acreage is never actually infested by rootworm, and infestation level is influenced by several factors such as soil type, pest history, and cropping practices. These factors have been

integrated into a risk index that identifies fields at risk for rootworm damage to peanut pods so only those fields are treated. Over the past four years, cooperating with growers and VA and NC Cooperative Extension Agents, the index was evaluated on 198 peanut fields in VA and 184 in NC.

Management of Wildlife Damage in Suburban and Rural Landscapes
Other states involved: CT, MD, NJ, NY, PA, VA, WV
Brief description: This cooperative effort seeks to find workable solutions, both in terms of physical methodologies and in theoretical investigation, to help resolve existing human-wildlife conflicts, especially those causing significant economic and physical property losses. Emphasis initially will be directed toward resolution of white-tailed deer (*Odocoileus virginianus*) and Canada goose (*Branta canadensis*) problems in both residential and agricultural production settings.

Disease Control in Field Crops
Other states involved: NC, SC, GA, TX, OK, AL, AR, LA, TN
Brief description: Applied research and extension programming in cotton and peanut are shared and coordinated with extension plant pathologists in other states. The American Peanut Research and Education Society, Cotton Foundation, and private industry sponsor annual meetings where specialists report the successes and impacts of projects in each state. These meetings are structured to allow specialists to discuss their current control recommendations and needs in a given region.

Logging Safety
Other states involved: 13 Southern States (VA to TX)
Brief description: This program represents a cooperative effort between Workers Compensation Insurance Providers for the logging industry across the South to establish the annual Total Case Incident Rate (TCIR) for mechanized logging contractors within the region. The TCIR is the recognized measure for reporting industrial accidents and injuries. Periodically, extensive data is gathered from the same cooperators to conduct in-depth injury analyses for the logging industry. Results from this work are broadly published and used by groups such as the Timber Harvesting and Transportation Safety (THAT'S) Foundation and the Forest Resources Association's Southwide Logging Safety Committee to develop targeted logging safety training materials and programs. Partial funding for this work comes from the THAT'S Foundation.

Fruit (grape/wine) Industry Sustainability
Other states involved: NY, PA, MD, NC
Brief description: The interstate nature of this effort owes to collaborative efforts both in research and in extension. Collaborative work was conducted with Cornell University on obtaining funding (CSREES/USDA) for, and sharing results with respective industries, of wine grape variety and clone evaluations conducted in both NY State and in Virginia. Funding was also obtained from the North Carolina Grape Council to support variety and clone research here in Virginia. Collaborative extension efforts were also conducted with New York, Maryland, and Pennsylvania. An information sharing meeting among these specialists was help in November 2000. Most recently, this resulted in a team-taught "beginners" seminar conducted at the AHS Jr. AREC and was attended by 53 clientele. The same basic course will be taught in SE

Pennsylvania in March 2002, with the same instructors. Groundwork was also laid during the reporting period for an agent training program in NC, scheduled for January 2002.

Southeast Greenhouse Conference and Trade Show
Other states involved: NC, SC, GA, FL, AL, TN
Brief description: This activity is a three-day educational program and commercial trade show for greenhouse operators. The educational program is developed in conjunction with a Board of Directors composed of commercial growers. The program is always designed to address the most high priority areas of concern to commercial growers. The program is very affordable and the educational programs address needs of beginning or small operations as well as those of larger operations.

Good Agricultural Practices
Other states involved: NY, FL, SC, TX, KS, CA, MO, MI, NC, GA,
Brief description: This program is designed to train extension agents to deliver programming on improving the microbial safety of fresh produce during farm production through the handling and packing phases. It assists them in delivering this information to producers. This program addresses maintenance of food safety and the marketing of safe produce. These are critical issues for producers. The program addresses all producers regardless of size or scale.

Development and Testing of a Phosphorus Index for Site-specific Nutrient Management Planning
Other states involved: MD, DE, PA
Brief description: This integrated research and extension program seeks to develop and test a decision aid for field-specific assessment of phosphorus loss potential. Farmers are under increasing pressure to plan animal waste applications according to the phosphorus loss potential of each particular field on a farm. This tool will permit them and the nutrient management planners working with them to assess site-specific phosphorus loss risk and adjust nutrient management plans accordingly. The program focuses primarily on livestock farms, whomever may be the operators.

U.S. Farm Policy and Economic Impacts on Southern Agriculture
Other states involved: All 12 other states in the Southern Region
Brief description: Members of the Southern Extension Public Affairs Committee (SEPAC) develop background materials and makes presentations to help analyze alternatives whenever a Farm Bill is considered by the U.S. Congress, as well as when other important legislative or regulatory developments occur that will impact Southern farmers. Southern farm income is critically impacted by farm policy, and farmers are extremely interested in alternative proposals for farm policy and implications on their farming operations. The program specifically addresses the impacts of rural development policy on underserved audiences.

Farmer Direct Marketing Programs
Other states involved: NJ, DE, MD, PA
Brief description: Regional programming in direct farmer marketing has given farmers located in Virginia insights into Mid-Atlantic on-farm marketing methods. The combining of information in a regional format gave conference planners' access to better speakers, more

exhibitors and more networking. By rotating the location of the conferences, Virginia farmers were able to network and observe the most modern merchandising and management methods. They were able to learn from experts in risk management, merchandising, and farm business planning. Larger conference participation gave us a larger budget to compensate quality speakers and attract more trade show exhibitors. The exhibitor trade show demonstrates new farm inputs used in the marketing process. The number of exhibitors increased from 30 firms to over 65 with the move toward regional programming.

Firm Management and Marketing in Food Processing
Other states involved: MD, DE
Brief description: Beginning in 1992, the Virginia and Mid-Atlantic Food Processor Association merged their educational programs. The small and medium sized food processors have been faced a difficult economic climate. Many were driven out of business beginning in the 1950 in the Mid-Atlantic region. The remaining Virginia food processors merged in 2000 with a Virginia food manufactures. The merged group continues the educational program started in 1992. The program offers the industry a comprehensive program dealing with issues and problems faced by the food processing and manufacturing industries. A planning committee formulates each future program in an intensive three day planning program in which the conditions of the industry are discussed, issues and problems are identified, and a program is prepared. After the planning meetings are completed, an educational program is produced for the industry sector.

Farm and Power Dealerships in Marketing Equipment
Other states involved: DE, MD, WV, NC, SC
Brief description: Beginning in 1990, the Virginia Equipment Dealers Association merged with the Delmarva Power and Equipment Association, and soon after with the Carolina Power and Equipment Association. The surviving entity is known as the Eastern Equipment Dealers Association. The Virginia dealers developed an education committee and a formal program beginning in 1973. The Eastern Association accepted the program of work began earlier and operates the educational program based on a dealer education plan with five strategic objectives based on forty defined problems at the firm level. With one exception in forty years, an annual dealer management conference is held for owners and managers in a six state region servicing the farm and power equipment industry.

Maxbull sire selection program
Other states involved: MI, NE, MN
Brief description: Maxbull is a computer program that chooses dairy bulls to meet the breeding objectives specified by individual dairy farmers. The farm breeding objectives are used to select bulls from most recent genetic evaluations in February and August of each year, with the option to run the program in May and November as well, if desired. Maxbull selects bulls with the highest possible merit for a trait or index specified by the dairy farmers subject to other constraints such as stud affiliation, semen price, and calving difficulty evaluations. Extension specialists or dairy geneticists in the states mentioned above use Maxbull in their states.

Mid-Atlantic Cropping Systems
Other states involved: MD, NC, PA
Brief description: This activity involves field research and in-depth studies to evaluate the impact of three cropping systems on crop productivity and soil quality. Extension education and field days are a continuous part of the plan of action. Stakeholders are interested in improving their ability to compete at current world prices. There is also extensive and intensive interest in the impact of changes in cropping systems on nutrient movement through soil. This project addresses both of these issues. This project and the information is presented at numerous area agricultural meetings that are well attended by under-represented audiences.

Mid-Atlantic Regional Cropping Systems Project
Other states involved: NC, MD
Brief description: Corn, soft red winter wheat, and soybeans are grown on over 6.5 million acres in the mid-Atlantic region (Virginia, North Carolina, Maryland, and Pennsylvania). These crops are a significant factor in the rural economies ($1.5 billion in 1995) and greatly impact the environment because of the extensive production areas, most of which are located in nutrient-sensitive watersheds. However, grain production is needed because the region is deficit with respect to grain needs for livestock feed. Major goals of the project are: (1) to improve crop production efficiency and profitability; (2) to minimize environmental impact of crop production; and (30 to maintain and/or enhance soil quality in order to have sustainable production systems. A total cropping systems approach which integrates knowledge from many disciplines is being used in a series of experiments to increase N-use efficiency in corn and wheat production, develop techniques to improve no-till wheat production, evaluate early-maturity soybean production, and combine all practices in a cropping systems experiment to evaluate various crop rotations. Site-specific management techniques such as variable rate N applications and variable rate planting are being utilized in selected experiments and demonstrations.

Goal 2: To provide a safe and secure food and fiber system

Development of Dairy & Animal Production Food Safety InfoBases
Other states involved: National
Brief description: Initially, this program was to compile as many references related to on-farm milk safety and quality as could be found over the web and incorporate them into version 4 of the national dairy database, called Dairy InfoBase. Specialists in dairy production, dairy products, and veterinary medicine from many states are part of the milk safety and quality domain. The Dairy InfoBase is available in CD-ROM and the web through the ADDS Center (Agricultural Databases for Decision Support). Subsequently, funding was obtained from USDA FSIS to create a set of teaching and training modules (curricula materials) suitable for electronic delivery addressing the priority areas of on-farm food safety in all animal commodities. The modules are intended for a diverse audience including Cooperative Extension System field staff and specialists, other educators, consultants, veterinarians, service personnel, and producers of food animal products and will be disseminated through the ADDS Center. The materials include a supporting food safety knowledge base and provide selected and appropriate educational materials that have been developed in recent years through federally and state funded projects and programs. A steering committee consisting of extension specialists in various animal

commodities, food science, and veterinarian medicine from throughout the U.S. was formed to establish criteria for the modules.

Safe Quality Food: Farm to Consumer
Other states involved: WV, NC, NY, WA
Brief description: This project focuses on the development and implementation of a safe quality food system for the food industry. The target audience is dairy producers, apple growers, and produce growers. This food safety program builds on the principles of hazard analysis critical control system and is designed integrate safety and quality issues together. The project addresses food safety issues from farm to consumer that have been identified as important issues by stakeholders. These audiences are not specifically targeted in the project; however, they benefit from a safer food supply.

Southern Region Pesticide Education Center
Other states involved: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX
Brief description: The Southern Region Pesticide Safety Education Center was developed by the Southern States to enhance pesticide safety education programs throughout the region by offering educational programs to pesticide safety educators in the region. The audience includes Extension agents, specialists, and both state and federal regulatory personnel. The Center is physically housed at North Carolina State University. NCSU sponsors two courses in Raleigh annually. These three-day workshops are preceded by an on-line instructional component developed by Virginia Tech. Enrollees participate in the on-line course prior to and as a condition to attending the workshop.

Goal 3: To achieve a healthier, more well-nourished population

Investing in Healthy People—Multi-State Approaches to Heart Health
Other states involved: WV
Brief description: West Virginia and Virginia are planning a multi-state nutrition and health training in April 2002, entitled "Investing in Healthy People—Multi-state Approaches to Heart Health." The training will focus on the latest research and educational interventions related to heart disease and physical activities for families. This program is being funded through the National Extension Association Family and Consumer Sciences 2002 Public Affairs Mini Grant Program.

EFNEP Cost Benefit Analysis Assistance
Other states involved: OK, NH, GA, OR, IL, IA
Brief description: In 1998, Virginia Cooperative Extension completed a cost-benefit analysis of the Virginia EFNEP. In 2000, a national satellite broadcast was conducted to train EFNEP personnel from other states on how to conduct a cost-benefit analysis. In the past year, Extension faculty from VCE have worked with six states interested in conducting cost-benefit analyses of their EFNEP.

Goal 4: To achieve greater harmony (balance) between agriculture (production activities) and (steward and protection of) the environment

Commercial Vegetable Growers
Other states involved: MD, DE, NJ, PA
Brief description: The purpose of this project is to facilitate the exchange of relevant information for the management of diseases of commercial vegetable production in the mid-Atlantic region, and to produce coordinated recommendations for effective disease management of these crops. The group meets several times each year to discuss research results, and once each year to modify and up-date the Commercial Vegetable Production Guide, VCES Pub. No. 456-420. This project provides the best, most current up-to-date information for managing the most important diseases of commercial vegetable production. The project provides information to all levels of commercial vegetable production.

Water Quality and Waste Management
Other states involved: NC, SC, GA, FL, LA, PA, IN, MI, OK, TX, KS, WY, WA, OR, CA, HA
Brief description: Two separate programs exist: 1) Composting in the Southeast Conference is a biennial event that incorporates input from Cooperative Extension Specialists in VA, NC, SC, GA, Fl, and LA. The conference provides practical training and research updates for the composting and compost use industry, including in-service training opportunities for Extension agents throughout the southeastern U.S. 2) The W-170 Multi-State Workgroup conducts and annually reports on research and extension programs designed to investigate and provide education on the bioavailability of waste constituents. Both programs address critical issues identified by stakeholders. A key purpose of Program #1 (Composting in the Southeast Conference) is to provide information on issues critical to environmental quality aspects of waste management. The purpose of Program #2 (Bioavailability of Waste Constituents) is designed to answer questions regarding the environmental effects of land applying wastes, especially biosolids, whose use has been identified as a high concern by local governments and citizens.

Pilot Testing of Poultry Environmental Assessment Systems
Other states involved: PA, GA
Brief description: This is an educational program designed to help poultry producers minimize adverse environmental impacts from their operations. The project involves modifying an environmental management system developed nationally to reflect operational practices and environmental concerns in Virginia. The materials will be adapted and piloted tested in Virginia during 2002. Poultry producers in Virginia are faced with ever-increasing environmental regulations. This program is designed to help them comply with these regulations.

Nutrient Fate and Transport Associated with Chicken Litter Stockpiles
Other states involved: MD
Brief description: This is an applied research project designed to evaluate the pollution potential of various methods of storing chicken litter, including covered piles, uncovered piles, and in storage sheds. Poultry producers in Virginia produce over one-half million tons of poultry litter annually. This litter is generally stored for land application during a period when the ground is not frozen and crops are actively growing. Producers wish to store the litter using the least-cost

method. However, it is important that the storage method used not pollute ground or surface waters. The results of this study will inform policy makers and potentially effect environmental regulations. These audiences will be served to the extent that under-served and under-represented audiences are effected by environmental regulations addressing poultry producers.

Environmental Economics/Water Quality
Other states involved: MD, PA, DE, WV, NY, DC
Brief description: The program deals with resource protection and enhancement in the 43,000 square mile Chesapeake Bay drainage basin including all or part of the five states and DC. The research and implementation program integrates protection and enhancement efforts in five major areas: living resource protection and restoration, vital habitat protection and restoration, water quality protection and restoration, sound land use, and stewardship and community engagement. Efforts deal with agricultural, rural areas, suburban areas and urban areas on an integrated basis. Resource conservation and conversion of resource lands (agricultural, forest and open lands) is a significant issue under the sound land use category. In June 2000, "Chesapeake 2000 - A Watershed Partnership" agreement was signed by the Governors of VA, MD and PA plus the Mayor of DC. This agreement provides a strong basis and direction for all federal, state and local resource related actions. Substantial citizen and stakeholder input influenced the development of the Chesapeake 2000 Agreement. Numerous citizen and stakeholder advisory committees will monitor and assist implementation of the agreement.

Powell River Project
Other states involved: WV, KY
Brief description: The project focuses on faculty who conduct research to address mine-reclamation and coal-mine environmental protection practices and who work with regulatory agencies and industry to implement research results as improved reclamation and environmental protection practices. The Powell River Project operates with a Board of Directors that represents the coal industry and other mining-region community interests. The Board helps establish research and education priorities. Expected impacts are improved reclamation and environmental protection practices, and a regulatory climate that accommodates changing practices that are based on scientific research. Changes have been documented by companies involved in the project. For example, two such firms are currently putting in mine reforestation field trials based on Powell River Project (PRP) research. A number of firms are using PRP mine vegetation and coal refuse reclamation guidelines. Linkage of research with extension, allows communication of industry research needs to researchers, and communication of research results to industry through extension.

Goal 5: To enhance economic opportunities and the quality of life among families and communities

School Gardening and 4-H/Youth
Brief description: An effective outreach program is interdisciplinary, based on identified needs of the community and integrates the research, teaching and extension missions of the university. Although the department has long been involved in 4-H programming, a need was observed to better equip teachers to meet the Standards of Learning through the use of horticulture as a thematic teaching tool. To identify the actual need, an undergraduate research project was

completed, surveying teachers across the state. Based on the high level of positive response, a graduate research project surveyed teacher nationally who had been using horticulture successfully, in order to determine the criteria for success. This study was conducted in cooperation with faculty in education. The data collected in these surveys (both published in HortTechology, a journal of ASHS) was used to design and teach a course for teachers either for graduate or re-certification credit. Simultaneous to conducting these studies, work of VCE Master Gardeners and VCE 4-H programs was supported by the department to strengthen their abilities and enhance their resources to work with youth. In addition, relationships were build with the major botanic gardens around the state particular their youth education programs. With these partnerships in place, the course, Hort 6004: Integrating Horticulture into the Elementary School Curriculum to meet the Standards of Learning through Interdisciplinary Experiences has been taught for the last 3 summers at a botanic garden in other parts of the state. Teaching the course at these locations allows more teachers to take the course and, more importantly, allows us to familiarize the teachers with the local resources including VCE agents and Master Gardeners that will be valuable in their success in the future. We have been asked to teach the course at all four of the major botanic gardens next summer if funds are available. In addition, the 4-H horticulture program has expanded through the cooperative efforts of 4-H and ANR agents and Master Gardeners. A new joint program between 4-H and Master Gardeners will bring in-depth programming to young plant enthusiast around the state through the 4-H Youth Master Gardener Program. A new In-School Plant Science curriculum has been introduced and agents are being training on the implementation of these projects.

Horticultural Therapy
Other states involved: MD, Mid-Atlantic Region
Brief description: Interdisciplinary work with faculty in the Department of Human Development and the Adult Day Center on campus has resulted in an outreach effort through VCE. Partnerships have been formed with faculty from the Department of Human Development serving on committees for graduate and undergraduate students in Horticultural Therapy. One faculty served on the advisory committee for the establishment of the Adult Day Center and currently is an affiliate of the Center of Gerontology. Work with the VCE agents and Master Gardeners has lead to successful programming in nursing care facilities across the state. Based on research conducted the summer 2000 and a training program at the Master Gardener College, the need for a handbook of horticultural activities for dementia and Alzheimer patients was identified. It is being written cooperatively by a team of undergraduates, a visiting scholar from Korea, and faculty from both departments. This book is designed for use by Master Gardeners and activity directors. Testing of activities took place in research conducted in summer of 2001. Field testing of the completed book is schedule for spring and summer of 2002. It is expected that resources will be in place within two years to begin a course offered around the state for professional development of Activity Therapist, Recreation Therapists, Occupational Therapist, counselors and other health care providers. This project is linked closely with work being done in Japan to provide horticultural activities through volunteers and professionals to their elderly population. Master Gardeners from Virginia and Maryland were trained on implementing activities for dementia care clients at a recent regional horticultural therapy meeting. Our work with horticultural therapists and botanic gardens in VA and MD has lead to a series of annual conferences on HT and the formation of a regional chapter of the American Horticultural Therapy Association.

National Camping Brochure
Other states involved: MI
Brief description: Virginia 4-H has the second largest camping program in the nation. As a result, Michigan State 4-H and the Virginia 4-H Office are collaborating to develop promotional materials to promote the 4-H camping program on the national level. This initiative is being conducted on behalf of the National 4-H and Environmental Education Taskforce. This taskforce helps to coordinate 4-H camping initiatives on the national level.

Extension Cares: Out-of-School-Time for Teens
Other states involved: NV, CO, WA, AK, NH, MO, TN, SD, MA, MD, FL
Brief description: The purpose of the initiative is to increase the quality, affordability, accessibility, availability, and sustainability of child care and youth development programs through federal, state and local partnerships that tap the expertise and assets of local communities. The out-of-school time subcommittee has conducted a survey of existing extension resources related to teens in the out-of-school time arena. A list-serve has been established to facilitate communication among participating states. A web-based tool-kit of support resources is also being created.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution Virginia Polytechnic Institute and State University
State Virginia

Check one: ____ **Multistate Extension Activities**
_X_ **Integrated Activities (Hatch Act Funds)**
____ **Integrated Activities (Smith-Lever Act Funds)**

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
1. To achieve an agricultural production system that is highly competitive in the global economy	**$187,000**	**$206,000**	_____	_____	_____
2. To provide a safe and secure food and fiber system	**40,000**	**45,000**	_____	_____	_____
3. To achieve a healthier, more well-nourished population	**10,000**	**15,000**	_____	_____	_____
4. To achieve greater harmony (balance) between agriculture (production activities) and (stewardship and protection of) environment	**30,000**	**45,000**	_____	_____	_____
5. To enhance economic opportunities and the quality of life among families and communities	**34,000**	**50,000**	_____	_____	_____
Total	**$301,000**	**$361,000**	_____	_____	_____

Kriton Hatzios — **Director**

2/25/02 — **Date**

Form CSREES-REPT (2/00)
Note that the approved target of 10% was attained.

Brief Summaries of Integrated Activities (Hatch Act Funds)

Goal 1: To achieve an agricultural production system that is highly competitive in the global economy

Political Economy Of Agricultural Trade And Domestic Policies

The U.S. farm sector faces opportunities and challenges in world markets. This project examines U.S. farm policy options for enhancing competitiveness of U.S. export crops, and strategies for simultaneous opening of U.S. markets for imported products.

Economic Analysis Of Price Discovery And Public Policy Issues In Concentrated Agricultural Markets

The pricing system in livestock has failed to coordinate production with consumer needs. Under cost-price pressure, the processing sector consolidated. Demand has decreased. The lack of producer-level profitability is prompting calls for increased market regulation. The purpose of the project is to provide research results on the economic causes of low prices and lack of profitability and help guide efforts to regulate firm behavior in the marketplace.

Price Risk Management For Virginia's Grain And Livestock Sector

Changes in farm policy and the tendency for large scale contracting among swine producers has made price risk management a high priority among Virginia's grain, soybean, and swine producers. This study develops price risk management tools for farmers to use to minimize the effects of market price variation. Tools developed include forward contracting, forward selling, hedging strategies, and options trading. Crop insurance strategies are also examined.

System Analysis Of Issues Related To Production, Harvest, & Delivery Of Herbaceous Fiber For Biofuel

Fuel produced from renewable resources will reduce air pollution, provide new markets for farmers, and reduce petroleum imports. This project describes a system analysis to study interrelations among the production, harvest, storage, and transportation issues associated with the year-round delivery of herbaceous fiber to an ethanol conversion plant.

Improving Genetic Potential For Yield And Quality Of Soybeans

High yielding new soybean varieties with disease resistance and improved seed quality are needed to keep soybean production profitable and to meet market demands. This project is developing soybean varieties that are well adapted to Virginia and surrounding states and possess resistance to viruses and soybean cyst nematode as well as improved quality traits such as low saturated fats (low palmitic acid), low rancidity-causing factors (low linolenic acid), higher protein and suitability for soyfood processing.

Breeding And Genetics Of Barley And Wheat For Increased Productivity And Durability

Yield and quality of wheat and barley are limited most by diseases, insects, and environmental stress. The goal of this project is to ensure a safe and ample food supply through the

development of wheat and barley varieties that possess durable resistance to disease and insect pests.

Restoration Of Drastically Disturbed Lands

Lands drastically disturbed by mining and construction activities threaten water quality and are frequently low in productivity and land use potential. The primary purpose is to develop new strategies to successfully stabilize, revegetate, interpret, and classify drastically disturbed lands.

Selection For Aseasonal Reproduction In A Crossbred Sheep Population

Domestic sheep exhibit a seasonal breeding pattern, with reduced fertility in the spring and summer. This project involves identification and selection of individuals that remain fertile throughout the year.

Improving Reproductive Efficiency & Facilitating The Use Of Artificial Insemination In Beef Cattle

Genetic improvement of cattle is limited by the traditional use of natural service breeding. The objective of this project is to improve reproductive efficiency of beef cattle and to promote the use of artificial insemination by improving methods of estrus synchronization in cattle.

Regulation Of Feed Intake In Poultry

Various physiological mechanisms are responsible for controlling food intake in poultry. This project investigates the mechanisms whereby the brain controls food intake in birds selected for egg production or meat production.

Rumen Fermentation

This project focuses on optimizing the rumen fermentation system and minimizing metabolic animal health problems in order to develop more efficient methods for the production of human food by cattle by adjusting fermentation with chemical agents and mineral salts, controlling nutrition and environment of rumen microrganisms and maintaining tissue homesotosis.

Computer-Assisted Decision Aids For Beef Cattle Breeding, Management And Marketing

Beef cattle producers face a bewildering array of management options. In this project, an expert system is developed that suggests management strategies to improve heifer reproduction. Also, a computer-assisted management decision aid is developed that allows biological and economic impacts of alternative breeding, management, and marketing options to be compared.

Integration Of Quantitative And Molecular Technologies For Genetic Improvement Of Pigs

Genetic evaluation programs predict performance of purebred offspring of purebred parents. Most commercial swine herds have crossbred sows and produce crossbred offspring. This project is designed to determine how accurately purebred evaluations predict crossbred offspring performance.

Improved Forage/Livestock Production Efficiency

Warm season forages are useful in situations where cool-season forages are relatively nonproductive during hot, dry conditions. In addition, legumes are needed throughout the growing season to provide nitrogen and improve forage quality. Prior research showed flatpea, a legume used in land reclamation, to be toxic to sheep. A follow-up feeding study using flat- pea for cattle was completed and the data will be analyzed and reported. Three years of data for bermudagrass grazed by lambs were obtained and will be analyzed and reported. A new study will be initiated using bermudagrass as the warm-season component of a year-around grazing system for cattle. Research will also be conducted on developing cool-season/ warm-season species mixtures for growing livestock.

Molecular Regulation Of The Ovine Insulin-Like Growth Factor Genes

Differential expression of 5'-variant ovine IGF-I and -II mRNAs will be examinedin a variety of tissues at different developmental stages using a ribonuclease protection or polymerase chain reaction (PCR) assay. Promoter elements for the ovine IGF-I gene will be localized by transfection of DNA constructs containing putative promoter elements linked to a luciferase reporter gene. DNA-binding proteins which interact with these promoter elements will be identified by gel shift and DNase footprinting assays.

Young Sire Selection And Testing Programs In Dairy Cattle And Tests Of The Effectiveness Of Selection

Genetic improvement in dairy cattle is dependent upon accurate selection and progeny testing of young bulls. The purpose of this project is to evaluate various aspects of young sire selection and progeny testing to determine areas that need improvement.

Evaluation Of Profit From Technological Improvements In Dairy Management

Dairy herd managers have opportunity to adopt new technologies without knowing probable effects on profitability. This project develops computer models to calculate projected economic benefits of adopting new technologies to increase the efficiency of herd reproduction and milk production.

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Human Dimensions Research And Management Effectiveness Of Natural Resource Agencies

Many natural resource management agencies lack information on stakeholder opinions (both internal and external) needed to make effective management decisions. This project improves agency understanding of stakeholder opinions of management performance.

Assessment Of The Potential Of Monoploid Potato Germplasm

Haploids plants with reduced chromosome number have been instrumental in the development of new cultivars of many crops; their potential in potato is yet unknown. This purpose of this project is to use anther culture to develop potato haploids (monoploids) with only 12 chromosomes and estimate their relative vigor in field studies.

Growth And Fruiting Of Young Apple Trees

Early yields are critical to the economic success of high-density apple orchards, a relatively new approach to production and culture. This project evaluates the potential benefits of tree support and severity of pruning on the yield of apple trees in their early years.

Environmental, Developmental And Physiological Bases Of Cucurbit Seed Quality

The purpose of this project is to identify and quantify the effects of maternal environment, cultural practices and seed maturity on cucurbit seed quality; investigate the physiological basis of the development and retention of seed quality during maturation, storage and utilization as influenced by production environment; and, characterize the physiological, biochemical and molecular regulation of germination and dormancy in cucurbits.

Senectopathic Disorders And Development Of Non-Pesticide Methods For Their Control On Turfgrasses

The functional roles of turfgrasses include erosion control, reduction of the negative impact of air pollutants, enhancing the landscape, and providing playing surfaces for various recreational and sports activities. Collectively, turfgrass disease control programs are the number one consumer of fungicides in the United States. The purpose of this study is to develop programs that reduce the occurrence of turfgrass diseases through biological control procedures and informed management practices rather than the use of pesticides.

Evaluation And Refinement Of Forecast Models For Grape Diseases, And Studies Of Sour Rot On Grape

Grape growers in the eastern USA apply many fungicide sprays against fungal diseases, including black rot and Botrytis bunch rot. Some of these sprays are unnecessary. Detailed knowledge of conditions under which infection takes place will allow omission of unnecessary sprays. This research will add to our knowledge of infection conditions, and augment our ability to improve timing of fungicide applications.

Impact Of Genetically Engineered Crops On Weed Control Programs For Virginia's Agriculture

The three primary objectives of this research are 1) Identification of appropriate rates and timings of application for herbicides in corn and soybeans in which tolerance to the herbicide has been increased via genetic transformation or via traditional breeding procedures, 2) Documentation of the occurrence of sethoxydim resistant johnsongrass in Virginia and identification of patterns of development of this species under varying crop rotation, tillage, and

herbicide use regimes, and 3) Evaluation of control programs for sethoxydim resistant johnsongrass and other resistant weed species.

Evaluation Of Maize Germplasm For Resistance To Gray Leaf Spot Disease Under No-Tillage Production

This project evaluates selected commercial, public and experimental hybrids, inbred and germplasm for resistance to gray leaf spot disease under natural disease pressure in continuous no-till corn production in Western Virginia. It also correlates grain yield losses with severity of leaf blighting caused by gray leaf spot disease and evaluates the fungal toxin cercorporin as a means to assess resistance, tolerance, and susceptibility of maize germplasm to Cercospora zeae maydis.

Role And Fate Of Adjuvants In Modifying Herbicide Action And Selectivity

Determine patterns of absorption, distribution, and metabolic fate of certain herbicides and adjuvants (applied singly or in combination) in higher plants. Evaluate herbicide-adjuvant-plant surface interactions that may influence deposition, uptake, fate, and activity -- with the goal of improving efficiency and reducing dose rates of herbicides under varying environmental conditions. Determine sites and mechanisms of the modifying effects of adjuvants on plant response. Explore the use of adjuvants to modify the mobility and fate of herbicides in soil.

Differential Sensitivity Of Selected Corn And Soybean Lines To Herbicide Injury

New technologies can help the management of weeds in corn and soybeans. This project examines the tolerance of selected lines of corn and soybeans to treatment with herbicides and protectants.

Biologically-Based Sustainable Tomato Production Systems Without Use Of Methyl Bromide

Since methyl bromide is destroying the stratespheric ozone shield, agricultural uses will cease. Biologically-based tomato production systems will be developed for Florida and Virginia, in which cover crops suppress pests, and yields are increases through better irrigation, fertigation and addition of organic matter to soil. The systems developed in this research will allow tomato production to continue after the ban of methyl bromide, and be more profitable in south Florida and Virginia.

Effect Of Crop Level & Fermentation On Chardonnay & Cabernet Sauvignon (Vitis Vinifera L) Glycosides

Profitability of grape growing is dependent upon maximizing yield while holding cost. Grape quality is largely dependant on aroma/ compounds which influence wine quality. The project exams the relationships between grapevine yield, aroma / flavor precursors and wine quality. The purpose is to better define the relationships between yield and wine quality under Virginia grape growing conditions. Also evaluated are methods of extraction of aroma and flavor precursors from the grape during fermentation.

Improving Management For Economic Sustainability Of Peanut Production

Increasing production costs and low commodity prices have substantially reduced profit potential in peanut production. Peanut producers are in need of improved technology to reduce production costs, increase yields and improve profitability. This project examines integration of general agronomic inputs and weed management for peanut to improve production efficiency and reduce costs.

Variety And Quality Evaluation Of Virginia-Type Peanuts

Data collected from all segments of the industry is needed before release decisions are made concerning advanced peanut breeding lines. Development of new peanut varieties without total industry input can lead to the release of varieties that are acceptable and advantageous only to a particular segment of the industry. This project evaluates, provides data, and recommends new peanut varieties for release that are acceptable by the total peanut industry including the grower, sheller, processor, and consumer.

Sweet Corn And Melon Production In Southeast Virginia Using Plasticulture

Management practices for melon and sweetcorn production to meet specific market windows must be developed for vegetable growers in the coastal plains of Virginia. Production systems using drip irrigation, plastic mulch, and row covers will be used to determine how early these crops can be planted and harvested.

Control Of Peanut Diseases With Minimum Inputs Of Fungicides And Nematicides

Peanut diseases cause annual losses of 15 to 20 million dollars in Virginia, and control requires a high input of fungicides and nematicides. This project seeks to develop effective disease management strategies that require a minimum input of fungicides and nematicides.

Development Of Integrated Pest Management Techniques For Improved Weed Management

Develop herbicide dose-response curves for major Nebraska weeds in corn and soybeans. Evaluate crop hybrid/variety selection and changes in crop plant population on the crop's competitiveness with weeds. With regard to economic, ecological, and environmental considerations, determine weed management systems that maintain weed populations below economic injury levels by integrating various weed disturbance scenarios such as reduced herbicide rates, crop plant population and/or spatial arrangement, crop rotation, and tillage.

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Improving Systems For Management Of Soybean And Peanut Arthropod Pests

Currently, many producers over use pesticides in their attempts to manage insect and mite pests of peanut and soybean. Better management programs could result in significant pesticide use reductions, with no loss of crop quality or yield. This project is designed to develop techniques for improving management of soybean leaf feeding insects and mite pests of peanut.

Control Of Diseases Of Tree Fruits

Fifteen or more major diseases impact apple and peach production in Virginia. Disease management research focuses on evaluation and proper timing of materials and practices for broad-spectrum disease control and testing of novel methods for managing fire blight. Ongoing evaluations help to determine the most appropriate alternatives for disease management. The goals of this project are to develop effective programs for control of diseases of fruit and foliage of apple, peach, and nectarine and screen for resistance to other diseases in scab-resistant apple cultivars.

Chemical Thinning Of Apple

The major cullage factor for apples is inadequate fruit size. Cost of hand thinning may vary from $500-1500/acre, and thus is considered prohibitive. Over-cropping greatly increases the number of small fruit, reduces the next season's return bloom, and reduces crop value. This project determines the potential effects of low light and night temperatures on natural fruit set and effectiveness of chemicals used for fruit thinning. A better understanding of chemical thinner interaction with light and temperature may lead optimizing crop load and higher crop values.

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Managing Bedding Plant Growth With Plant Growth Regulators During Nursery Production

Annual and perennial bedding plants rapidly outgrow their containers during nursery production. Manual methods of controlling growth are labor-intensive and costly. The purpose of this project is to develop methods of controlling growth and maintaining quality of bedding plants during production with applications of chemical growth regulators.

Management Of Resistant Weeds

Weed populations contain plants with mutations that make them resistant to control by certain herbicides. This research will identify smooth pigweed populations that are resistant to a class of

herbicides that inhibit synthesis of certain enzymes in plants. Patterns of resistance to various herbicides with this mode of action will be determined to permit rotating herbicides to avoid development of resistant populations.

Landscape Ecology And Management Of Principal Arthropod Pests Of Vegetable Crops

Arthropod pests are often a major constraint in vegetable production and insecticides are often needed to manage them. To meet needs of growers and expectations of consumers, pest management strategies must be developed that are economical, but rely less heavily on insecticide use, especially broad-spectrum products. To accomplish this goal, this project will integrate new knowledge of pest movement and population dynamics with novel pest management approaches that may include trap cropping and the use of selective insecticides.

Heritability, Predictability, And Cultural Manipulation Of Internal Heat Necrosis Of Potato

Internal heat necrosis is a physiological disorder associated with the potato cultivar used for chipping through out the south and the mid-Atlantic region. Growers can experience substantial economic loss from unsaleable tubers when growing conditions are conducive to expression of the disorder (high temperatures and low rainfall). This project examines the relationship between yield, specific gravity and susceptibility to internal heat necrosis and evaluates germplasm from several breeding programs for regional adaptibility.

Cloning Of Actinobacillus Pleuropneumoniae Capsule Genes For Vaccine Development

The capsule export genes have already been cloned following identification using a probe from a related bacterium. The structural region has putatively been cloned by "chromosome walking" upstream of the cloned region. We will now insert a SacB/Kanamycin gene into the structural region to inactive it. We will then attempt to transfer the foreign DNA into the structural region of the chromosome of wild type cells by homologous recombination. Alternatively, random transposon mutagenesis will also be used to inactivate the gene, and its identity confirmed with probes of cloned regions. The SacB/Kan gene will be cured from the recombinant strain by incubation on high sucrose media, which is lethal to cells carrying the SacB gene. This should also eliminate the Kan antibiotic gene. The resulting mutant should have a large deletion in its structural capsule region and be noncapsulated. This mutant will be tested for safety and efficacy as a vaccine candidate for swine pleuropneumonia.

Role Of Oxidative Stress In Pneumonic Pasteurellosis

Environmental stress, caused by shipping of animals, is known to suppress the upper lung immune and other defense systems allowing invasion of opportunistic organisms, a major cause of morbidity, mortality, and economic loses in feedlot cattle. This project will determine the mechanisms of the action of tumor necrosis factor-alpha (TNF-alpha) in mediating acute lung injury. Free radical scavengers will be administered to potentially protect the cells against the lethal effect of TNF-alpha.

Ontogenic Development Of The Intestinal Enzymes In Oreochromis Niloticus (Tilapia)

Little is known about the normal developmental appearance and distribution of digestive enzymes in tilapia's intestinal tract. This work studies the temporal appearance of selected enzymes from fry to young adult, and determines distribution of these enzymes along the length of the intestinal tract. Results should allow improved feeding practices and thus improved health and production of the fish.

Value-Added Concepts For Development Of Dairy Products

Osteoporosis is a leading cause of morbidity and mortality in women, but many women do not consume enough dairy products daily. This project will identify factors that motivate women of various ages and ethnic groups to consume or not consume dairy products.

Goal 2: To provide a safe and secure food and fiber system

Genetic Improvement Of Aquaculture Stocks

Genetic improvement of striped and hybrid bass and tilapias would contribute to the efficiency and profitability of commercial aquaculture operations. Four to six families representing each of six geographic stocks of striped bass are being evaluated for their survival and growth performances in recirculating aquaculture systems. Their utility for producing high-performance hybrid striped bass also will be assessed. Linkages of genetic markers with cold tolerance and growth rates in an f2 family of tilapia are being sought.

Evaluation Of Maize Germplasm For Resistance To Gray Leaf Spot Disease Under No-Tillage Production

Evaluate selected commercial, public and experimental hybrids, inbred and germplasm for resistance to gray leaf spot disease under natural disease pressure in continuous no-till corn production in Western Virginia. Correlate grain yield losses with severity of leaf blighting caused by gray leaf spot disease. Evaluate the fungal toxin cercorporin as a means to assess resistance, tolerance, and susceptibility of maize germplasm to Cercospora zeae maydis.

Defining Mce Antagonistic To Campylobacter Spp And Salmonella Spp

Using the classical methods described in the VPI anaerobe manual, isolate and identify as many anaerobic and facultative bacteria from an effective MCE culturex as possible (at least 200 distinctive bacterial clones). Provide facultative to ARS and assess antagonism of anaerobes against campylobacter and salmonella by employing discriminatory criteria, i.e., substrate competition, niche competition (adherence/attachment), VFAs, bacteriocines, etc. Provide effective, defined anaerobes to ARS for chicken challenge studies.

Occurrence, Control And Prevention Of Pathogenic Bacteria Infoods

To compare the sensitivity, specificity, and predictive value of diagnostic tests for detection of foodborne pathogens, especially E. coli 0157:H7 in feces and food products. To investigate the use of lux-cloned E. coli 0157:H7 to monitor sanitation of processing facilities and shelf-life of

meat products. To determine how chemical, physical, and microbiological baseline properties of poultry, beef, pork, and fresh fruits and vegetables are influenced by new processing techniques to ensure safety and quality.

Closure Integrity Testing Of Heat-Sealed Semi-Rigid Packaging

The objectives of this research are: To identify the sealing conditions that affect package integrity. To evaluate the effectiveness of destructive tests as a means of determining container integrity. To establish the operational parameters needed to acoustically inspect heat seal closures.

Biogenic Amines In Finfish Species

Biogenic amines are natural anti-nutrition factors that have been implicated in food poisoning episodes. Thus, they have been suggested as a standard of quality and safety in finfish species. Normal concentrations of the compounds in major finfish species must be determined as well as the effects of storage conditions and processing variables on their production. State and federal food regulatory agencies may establish unrealistic low defect action levels unless the presence and significance of concentrations are identified, which could lead to unnecessary product loss and litigation.

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Integrated Management Of Late Blight And Early Blight Diseases In Potato In Virginia

Late blight and early blight are two important diseases that reduce potato production and quality. A new, more virulent strain of late blight first occurred in Virginia in 1995 affecting 20f the potato acreage. The purpose of this project is to develop disease forecast systems for predicting presence of these diseases in potato fields, and to reduce the amount of fungicides required for control.

Effects Of Estrogen On The Immune System

Sex hormones have modulating effects on the immune in animals of agricultural importance to Virginia. This study will examine estrogen-induced apoptosis (a mechanism of cell death).

In Vivo Effects Of A Pesticide On The Immune System: Age And Gender Factors

The U.S. Congress mandated investigations into the potential health hazards of exposure to environmental estrogens. This project will study immunological effects of environmental estrogens in fetal, neonatal, adult, and geriatric stages of life.

Efficacy Of Extended Antibiotic Therapy For Environmental Streptococcal Mastitis

Mastitis is a prevalent problem among dairy cattle that results in substantial economic loss to the industry. This clinical field trial will compare standard antibiotic therapy (3 treatments) with extended therapy (9 treatments), and compare cost of treatment with loss of milk production.

Goal 3: To achieve a healthier, more well-nourished population

Utilizing Potassium Buffering Capacity To Predict Cotton Yield Response To Potassium Fertilizer

Fast fruiting modern cotton cultivars are sensitive to late season K deficiencies. To develop a method whereby we can predict cotton response to K fertilization across the U.S. Cotton Belt using the K buffering capacity.

A National Agricultural Program To Clear Pest Control Agents For Minor Uses

The public depends upon minor crops to provide a diverse and healthy food supply. NRSP-4 defines these as all crops except corn, soybeans, small grains, and cotton. The Food Quality Protection Act (FQPA) has defined minor crops as those grown on less than 300,000 acres nationally. Minor crop production is in a crisis due to accelerated pesticide registration and potential elimination of a large group of pesticides and their uses currently registered for those crops. The program is critical to growers to support clearance of viable and safe chemical and biological pest management tools.

Biochemical Changes Affecting Nutritional And Sensory Characteristics In Fermented Dairy Products

Fermented and nonfermented frozen yogurt will be manufactured with yogurt cultures at levels equivalent to refrigerated yogurt and with a culture of L. acidophilus added. Biochemical measurement of lactose degradation by action of beta-galactosidase, measurement of physical characteristics, pH, and titratable acidity will be completed at time of manufacture and throughout six month frozen storage. Stability of microorganisms to frozen storage will be assessed. Descriptive sensory techniques will be used to assess differences between products and changes that occur during storage. Consumer assessment of product acceptability will be determined. Improved digestibility of product resulting from hydrolysis of lactose will be evaluated by ingestion of products and measurement of breath hydrogen response.

Goal 4: To achieve greater harmony (balance) between agriculture (production activities) and (stewardship and protection of) the environment

Vt-Rbzm: A Model For Evaluating The Effectiveness Of Riparian Buffer Zones

Riparian buffer zones are being promoted as a means of protecting receiving waters from agricultural pollutants. There is considerable uncertainty, however, concerning the effectiveness of buffer zones for pollutant reduction. This project is investigating the effectiveness of buffer zones in trapping agricultural pollutants through the use of models that simulate the site-specific effectiveness of a variety of types of buffer zones.

Best Management Practices For Reducing Pollution From Concentrated Livestock Operations

Farmers need Best Management Practices (BMPs) to improve their position with respect to water pollution, and allow them to continue to operate their farms in harmony with the environment. This project will develop, implement, and examine several BMPs in the field to determine their effectiveness in reducing water pollution, and the concurrent suitability for farmers in terms of cost, longevity, and management for the measures installed.

Evaluating The Effectiveness Of Forestry Best Management Practices On Stream Water Quality

A network of runoff and precipitation monitoring stations will be installed on three small watersheds to evaluate the impacts of clearcutting with BMPs on water quality. Use the data collected to modify a computer simulation model to predict the impact of various forestry BMPs on surface water quality.

Production Of Multiple Herbivores On Utah Range And Forest Land

Study will estimate production and biomass of plant species and herbivore densities at Deseret Land and Livestock. We also will measure foraging rates. These measurements will be incorporated with weather data and literature values of conversion of water (for plants) and plant food (for herbivores) into living tissue to produce a simulation model of population dynamics for plants and herbivores. This model will be used in association with optimization and risk management techniques to yield a computer- driven management tool for livestock and wildlife producers.

Impact Of Treatment On Soil Suitability For On-Site Wastewater Treatment

Many soils are not suitable for onsite wastewater treatment and disposal systems and increase the potential for biological and chemical degradation of water. This project examines the potential for high quality wastewater to overcome soil limitations to wastewater renovation.

Nutritional Systems For Swine To Increase Reproductive Efficiency

A. Sow nutrition research requires large numbers to get valid data. Improved nutrition of reproductive sows could lead to enhanced sow performance and thus reduced cost of production. B. The effectiveness of increasing dietary lysine for high-milk-producing sows will be evaluated. The value of injecting a high level of vitamin A at weaning and breeding on sow performance will be assessed.

Biologically-Based Sustainable Tomato Production Systems Without Use Of Methyl Bromide

Since methyl bromide is destroying the stratespheric ozone shield, agricultural uses will cease. Biologically-based tomato production systems will be developed for Florida and Virginia, in which cover crops suppress pests, and yields are increases through better irrigation, fertigation and addition of organic matter to soil. The systems developed in this research will allow tomato production to continue after the ban of methyl bromide, and be more profitable in south Florida and Virginia.

Development Of Methods Using Plant-Insect Interactions For Pest Management In Vegetable Production

Most vegetable crops are produced in monoculture, which is favorable for buildup of pest insects. Planting strips of non-crop vegetation favorable for beneficial insects can reduce pest insect populations, confuse pest searching for the crop, and reduce need for pesticides to protect the crop against economic damage. The purpose of this project is to develop methods of crop production using increased diversity of vegetation for pest insect management.

Reduction Of Insecticides In Management Of Insects That Attack Soybeans, Peanuts, And Small Grains

Many insect pests attack soybean, small grains, and peanut causing crop loss and/or insecticide treatments by farmers. This project is developing and implementing several strategies to improve management and reduce reliance on pesticides. They include use of pest advisories and risk indexes, new treatment thresholds, use of genetically engineered and insect resistant varieties, and use of lower pesticide rates and/or environmentally safer products.

Goal 5: To enhance economic opportunities and the quality of life among families and communities

Clothing Expenditures Of Black & White Families: Research To Provide Info For Apparel Firms & Policy

To determine the effects of the income and demographic characteristics of American black and white families on their clothing expenditures. The research is being conducted to provide improved information for apparel marketers' and policy makers' decisions that impact the spending on this important product category by the increasingly diverse American consumer population.

Investigation, Characterization, And Survey Of Soils In Designated Counties In Virginia

Soil Survey, Mapping, and Characterization of Virginia Soils. The purpose of this project is to make soil maps according to standards of the National Cooperative Soil Survey. Included with the maps are soil descriptions, laboratory data, and interpretative recommendations designed for the multipurpose utilization of the soil resource.

Selected Plant Growth Regulators Influence On Cell Membrane Lipid Alterations

Adverse environmental conditions and nematode infestation reduces turfgrass quality. To evaluate the application of certain plant growth hormones to reduce effects of adverse environmental conditions and nematode infestation.

Determination Of The Trophic Support Capacity Of Se Reservoirs For Piscivorous Sport Fishes

Sport fish abundance in reservoirs is often limited by the supply of prey fishes. This project determines the adequacy of prey fish supply to meet the food demands of sport fish populations.

Enterprise Budgets For Selected Florida Vegetables

Estimation of vegetable production costs. This project estimates vegetable production costs for major fresh vegetables produced in Florida on an annual basis.

Annual Survey Of Quality Of Life In The Commonwealth Of Virginia

The quality of life in Virginia, as perceived by its citizens, requires continued monitoring for establishing trends and for consideration in proposing public policy. This project provides continuing "baseline" statistics and trend data for monitoring public perception of the quality of life in Virginia.

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Improving The Quality Of Life For Families In Southwest Va. Whose Adolescents Have An Eating Disorders

Eating disorders are a significant problem for adolescents in Southwest Virginia families. The purpose of this project is to investigate optimally useful treatment methods for eating disordered adolescents.

Osteoporosis & The Health Of Virginia's Older Women: Issues & Consequences Affecting Quality Of Life

The lifestyles of older women are physically, psychologically, socially, and economically challenged by their health problems. This project examines the health and well-being of older women living in southwest Virginia. The purpose of this study is to examine the functional,

psychological, and social consequences of living with health conditions, such as osteoporosis and chronic pain, and to identify management strategies the women use to maintain a satisfying quality of life.

Civil Rights

Virginia Cooperative Extension (VCE) is an educational outreach program of Virginia's land grant universities, Virginia Tech and Virginia State. It's mission is to enable people to improve their lives through an educational process that uses scientific knowledge focused on issues and needs. VCE is committed to the enhancement of equal opportunity and diversity in employment, programs, and collaborative efforts with volunteers and stakeholders. To continue building upon these commitments, strategies have been implemented which have yielded positive results, and are outlined below.

Equal Opportunity Employment

VCE does not discriminate against employees or applicants on the basis of race, sex, disability, age, veteran status, national origin, religion, or political affiliation. VCE strives to employ personnel that is representative of state demographics and has implemented effective recruitment, training, and retention efforts to ensure the existence of a competent, diverse workforce dedicated to working with all people in the Commonwealth.

Faced with the reality of ongoing retirements and other attrition, VCE has implemented an evolving plan which identifies qualified individuals, especially minorities, to fill vacancies as they occur. With the successful recruitment and hiring of non-traditional Extension agents continuing to be a challenge, especially as it relates to African- American males, VCE has integrated specific components aimed at workforce diversification into an overall recruitment plan.

VCE and the Virginia Tech Offices of Multicultural Affairs and Alumni Relations continue a partnership, which supports the position of Coordinator of Outreach and Community Relations. A responsibility of the position is to identify and utilize state and national networks to assist in recruiting and retaining qualified minority Extension faculty and staff that reflect the diverse population of the Commonwealth.

To the extent that educational assistance is an attractive recruiting tool, VCE has successfully used various methods of educational assistance designed to aid in the recruitment of agents, as outlined in the VCE Education and Professional Development Opportunities Program. This program has provided additional flexibility for recruiting underrepresented agents and for assisting employees in the pursuit of advanced degrees. Assistance includes, but is not limited to scholarship, tuition assistance, graduate assistantships, and paid internships.

All agent position announcements are electronically distributed to members of the VCE Leadership Council (ELC) which is comprised of diverse elected and at-large representatives

from the 22 Planning Districts in Virginia. The ELC mission is to advance and promote the educational programs of VCE and members assume an active role in recruiting process.

Agent faculty and state and district administrators have the responsibility of identifying potential non-traditional agents through networking at meetings, career programs, conferences, individual communications with peers, other Extension employees, and clientele.

Program Delivery

VCE operates as a joint program of Virginia State and Virginia Tech. While each university has its particular program strengths, program delivery at the local level constitutes a unified approach. The strength of Extension agents and specialists delivering programs to the people is the network of local Extension Leadership Councils which assist in the identification of local needs as well as the development and delivery of educational programs. ELCs are required to have members who represent the diversity in the communities served. VCE does not provide programs to or collaborate with other organizations that do not have nondiscrimination policies. "All reasonable efforts" are made and documented by Extension personnel to ensure that underrepresented clientele are involved in programs. VCE continues to rely upon specific strategies to include these audiences in its programs. Face to face contacts, marketing programs in minority media, strategic location of meetings and classes, and promoting programs through minority places of worship continue to be successful means of recruiting difficult-to-reach participants.

Agent faculty who deliver programs prepare and submit an annual Personal Action Plan (PAP) which is approved by the district supervisor at the beginning of the performance cycle. The plan must include a specific component for identifying at least one underserved audience with strategies for reaching a targeted group. During the evaluation meeting at the end of the performance cycle, the supervisor reviews the agent's progress in reaching the underserved audience(s) which was identified in the PAP. The supervisor evaluates the efforts and outcomes and considers these components when determining salary increases.

Public Notification

VCE requires specific methods for notifying clientele of its equal opportunity and non-discrimination policies. Among the numerous methods of public notification are the following:

- Equal opportunity/non-discrimination statements are displayed in all publications, letterhead, applications, and other printed materials.
- Extension volunteers are informed of the requirement of compliance with all principles of civil rights.
- Required signage, including the posters "...And Justice for All," and Know Your Rights, are prominently displayed in conspicuous locations in unit offices.
- Pictures in catalogs, Extension produced videos and publications, research bulletins and other publications reflect diversity in programming and employment.
- A standardized ADA statement to ensure accommodation for the disabled is prominent in all materials promoting programs or services.
- Unit extension offices use mailing lists of local churches and civic groups with minority membership to promote programs and employment.

- Position descriptions for all extension agent positions include responsibility for programming in accordance with EEO/AA/CR and diversity guidelines.

Civil Rights Training and On-site Civil Rights Reviews

Extension agents and specialists participate in various civil rights, diversity, and program outreach sessions as a part of new employee orientation, in-service training, and the annual conference.

Supervisors who conduct extension agent performance evaluations are trained to evaluate the specific requirement which reads: "Evidence of a commitment to working with diverse clientele and colleagues and a willingness to further the civil rights program of Virginia Cooperative Extension." Department heads and district directors continually review compliance progress with faculty conducting research and extension programs.

To continue building upon existing training efforts, VCE utilizes a non-traditional comprehensive internal civil rights review process designed to educate and train paid and unpaid staff in areas related to program outreach, equal opportunity, civil rights, and diversity. The process also includes an evaluation of records to ensure compliance with related policies and procedures.

The process is a peer concept, which allows Extension agents to observe how coworkers determine and implement planned outreach efforts to diversify the client based for achieving programming excellence. The basic review team is comprised of a state staff member, a district director, and three Extension agents, one from each of the three program areas. The Extension agent representatives on the review team are changed for each review allowing a greater number to participate in the experience. These agents then communicate the information and benefits of the experience with coworkers in his or her respective office. This is an effective method for exposing a greater number of units to the process.

Civil Rights Compliance Unit Review and other EO/AA and diversity information are located on a system-wide Intranet site which can be accessed and used as a reference by the entire VCE system.

VCE strives to conduct 14 reviews annually, including two local units per district, and an Agricultural Research and Extension Center (AREC) or 4-H center. The reviews consist of record examination and group and individual interactions and interviews with all faculty and staff. Volunteers involved in the unit programming process are invited and often participate in the review. The Extension hiring and programming processes are reviewed to determine the extent of employee knowledge and commitment to equal opportunity and diversity in employment. Upon conclusion of each unit review, findings and recommendations are shared with staff in an exit review with a follow-up in writing. The district director follows up with the unit to implement efforts for correcting deficiencies.