

Virginia Agricultural Experiment Station
and
Virginia Cooperative Extension
Agency 229

Working to the Benefit of Virginians

Agriculture and natural resources are Virginia's largest industry, generating approximately \$70 billion annually and close to 10 percent of jobs in the commonwealth. Virginia Tech's research and Extension faculty members are engaged in diverse programs that meet the needs of producers, processors, and consumers to support this industry so crucial to the state's economy.

Faculty and Extension professionals with multidisciplinary training in the colleges of Agriculture and Life Sciences, Natural Resources, and Veterinary Medicine at Virginia Tech as well as Virginia State University conduct these efforts on campus, in all 95 counties and many cities, and at 13 Agricultural Research and Extension Centers throughout the state. Faculty members utilize this network to ensure that the latest scientific findings reach Virginia agricultural and natural resource producers, processors, and citizens, who use these findings in their daily professional and personal lives.

As we seek to reduce the staggering economic and social costs of issues such as energy, environment, poor nutrition, infectious diseases, and health care, it is important that we also have an enhanced capability to provide the latest information, research findings, and technologies into the hands of end users. In 2007, Extension and research programs reached more than 1.9 million Virginians and generated more than \$69.8 million dollars to support research, which provided the ability to address critical needs of the commonwealth.

Virginia Agricultural Experiment Station (VAES) and Virginia Cooperative Extension (VCE) are dispersed in every locality of the commonwealth. For every state dollar of the \$69 million invested in VAES and VCE, \$1.44 is raised and matched in external funds by both organizations.

Program Impacts at a Glance

- Increasing profitability for agricultural producers and processors throughout the commonwealth
- 4-H – Shaping tomorrow's leaders with the help of more than 15,000 volunteers
- Working to prevent animal and human illnesses and to reduce health care costs in Virginia
- Benefiting the green industry and homeowners across the state
- Revitalizing Virginia's communities to become thriving environments for its citizens
- Improving environmental quality in the commonwealth
- Enhancing and diversifying the state's natural resource based industry

Program Impacts

Increasing profitability for agricultural producers and processors throughout the commonwealth

- Adding value to commodity crops, developing new products from “apparent wastes,” and integrating ecologically sound agricultural practices into crop production systems have the potential to give Virginia producers and processors a **competitive edge in the global market**.
- A study by Virginia Tech researchers shows that the local use values and the subsequent tax levy in 92 counties for farm and forest landowners resulted in a **reduction of more than \$111 million in total deferred real estate taxes for owners** in 2004. This reduction was based on the difference between the properties’ fair market value and the value in use.
- In 2006, **poultry and egg production** contributed approximately 34 percent of the farm income of all commodities. The last disease outbreak in the industry resulted in the destruction of more than 4.6 million birds at a cost of more than \$130 million. In 2007, a biosecurity audit program identified a case of avian influenza in the state in its early stages, allowing for immediate quarantine and containment to one farm, thus preventing widespread economic losses to the industry.
- **Cattle production** is an important agricultural industry in the state with more than three million acres of pastureland devoted to livestock production and \$456 million in gross revenue from calf and cattle sales. Research is underway to produce quality beef calves in a pasture-based system that meet consumer demands and increase profits.
- The Virginia **Quality-Assured Beef Cattle program** has improved health, management, and marketing practices for feeder cattle, resulting in more than 78,000 head being marketed and \$2.35 million in value-added income over the past 10 years.
- Incorporating warm-season grasses, such as bermudagrass, into grazing systems has increased the productivity and sustainability of **forage-livestock enterprises** in the state.
- Virginia Cooperative Extension’s “Link to Education about Forestry” program couples **livestock production and forest management** to enhance land profitability and sustainability. Program benefits include healthy forests, invasive species mitigation enhancement of wildlife habitat, maintenance of soil stability, and water-quality improvement as well as economic profitability.
- **Mastitis**, an inflammation of the mammary gland, negatively impacts milk quality and **costs the Virginia dairy industry \$18.6 million annually**. Understanding the bacterial profile of the disease-causing bacteria (which can vary from farm to farm) in a given herd can help identify and eliminate potential sources of the infections. Virginia Tech’s milk quality Extension program offers bacteriology testing to culture milk samples submitted from dairy producers in the state. Through a combined Extension effort with area dairy agents, milk culture workshops teach dairy producers about the types of bacteria that can cause mastitis and ways to control, treat, and eliminate them on the farm.
- The **Pork Quality Assurance** (PQA) certification and training program, a requirement for swine producers to maintain market access, was recently expanded to include a swine welfare component (PQA-Plus). More than 40 independent producers have achieved initial PQA certification, and 32 hold the new PQA-Plus certification. Certified swine producers not only maintain market access, but also gain new knowledge and insight into production practices that ensure production of safe, wholesome pork.

- **Laminitis**, a painful and debilitating disease of the foot, has major economic and welfare implications for the state's **170,000 horses and owners**, whose spending contributes \$505 million annually to the state economy and supports approximately 20,000 jobs statewide. Research indicates that avoiding obesity and diets high in certain carbohydrates in pasture-fed horses can decrease the laminitis risk.
- The culture techniques perfected at Virginia Tech for raising cobia, a fast-growing food fish, were provided to Virginia Cobia Farms in Saltville. The economic returns on an estimated 700,000 pounds per year will have a tremendous **economic benefit on Southside** in new jobs, transportation, and revenues.
- A post-harvest freezing process was developed to reduce levels of pathogens and ensure raw oysters are safe to eat. This **enables Virginia companies to sell oysters** for the raw half-shell market in California, a lucrative market for oyster producers in the state.
- Research-Extension teams have developed cultural practices for improving the **yield of field crops** (soybeans, small grains, corn, peanuts, and cotton) while reducing the use of costly chemicals. Crop advisories for insect and disease control, an early warning system for soybean aphid infestation and rust disease, up-to-date variety evaluations for greater yield, and strategies for reducing application rates of pesticides, fertilizers, and other chemicals, have enhanced production profitability, efficiency, and sustainability.
- With more than 2,000 acres planted in vineyards, **grapes** are one of the fastest growing crops in Virginia and considered one of the most lucrative alternatives to low-profit crops. Changes have been recommended by researchers to existing disease management practices for growers that have increased the profitability of grapes.
- Over the past decade, 27 wheat, 11 soybean, and 4 barley cultivars have been released from Virginia Tech **crop breeding programs**. Approximately 1 million acres of winter barley and wheat grown during the 2006-07 crop year was planted using certified seed of varieties developed at Virginia Tech.
- Extension-researcher teams have promoted newly improved disease-resistant **tomato** varieties and pest control practices that promise to help eliminate \$2.2 million in losses for fresh-market producers. Virginia currently ranks third in the U.S. in fresh-market tomato production, and growers rely on the latest Extension and research support to ensure their competitiveness and productivity in the future.
- Extensive field trial and laboratory analyses have improved disease resistance, reduced tillage requirements, increased yield, and enhanced end-product quality of Virginia- and runner-type **peanut** varieties. This has resulted in profitable recommendations for peanut growers.

4-H – Shaping tomorrow's leaders with the help of more than 15,000 volunteers

- Virginia Cooperative Extension's **4-H** program enrolled more than **140,000 youth and more than 15,000 volunteers** across the state, making it the largest non-formal youth development program in the commonwealth. The 4-H program teaches leadership, citizenship, and life skills that last for a lifetime.
- The **4-H Science, Engineering, and Technology (SET) initiative** pulls together resources from Extension to help strengthen the U.S. competitiveness in math and science. The goal is to prepare one million young people nationwide to excel in science, engineering, and technology.

- **Character Counts™** teaches positive behavior changes to youth participants, including respect and caring for others. Fifty-five county and city school systems have implemented 4-H Character Counts™, resulting in greatly improved student classroom behavior.
- The **Envirothon** program raises youth understanding of environmental issues related to forestry, wildlife, soils, and water resources.
- The **healthy youth program** promotes healthy nutrition and physical fitness to 4-H participants to decrease their risk of obesity and lay the foundation for healthy behavior for life.

Working to prevent animal and human illnesses and to reduce health care costs in Virginia

- The Food, Nutrition, and Health (FNH) initiative protects the public's health through scientific discovery and Virginia Cooperative Extension programs to prevent illness and reduce health costs. One program focus is the **prevention and management of obesity** because it is one of the most pressing global public health problems. Obesity dramatically increases the risk of most chronic diseases, including cardiovascular disease, diabetes, hypertension, and some cancers.
- The obesity research and education program partners with worksites, insurance agencies, health care organizations, and Extension to develop policies, programs, and practices that work on making healthy living the easy thing to do. Researchers currently study the impact of cash incentives to **employees at more than 20 worksites in Virginia to motivate them to lose weight.**
- Extension's **Healthy Weights for Healthy Kids** program responds to the obesity health concern in the commonwealth and reached 11,325 youth/students in 2007. Approximately 90 percent of the participants are estimated to have increased their knowledge and awareness of MyPyramid, how to choose healthy snacks and beverages, and the importance of positive body image and physical activity. Students also demonstrated an improved ability to use nutrition labels in making healthy food choices.
- Diabetes is the sixth leading cause of death in Virginia and leads to 11,700 hospitalizations annually, at a cost of nearly \$173 million. The **Dining with Diabetes** program helps citizens learn more about self-care, appropriate food choices, and lifestyle patterns that can **prevent or slow the complications of diabetes.** Dining with Diabetes was offered at nine locations across Virginia, and as a result, more than 90 percent of participants recognized the need for preventative annual examinations.
- Extension's Family Nutrition Program reached more than 70,000 low-income adult and youth with nutrition education in 2007. **For every \$1 spent on nutrition education for low-income adults, \$10.64 is saved in health-care costs.** Fifteen agencies form the program's leadership council and help guide the program. Additionally, thousands of volunteer hours are donated to the program each year.
- Researcher-Extension teams explore methods for the **prevention of infectious diseases**, such as West Nile virus, in livestock, wildlife, plants, and humans. This program has far-reaching implications for biosecurity, medical sciences, veterinary care, agribusiness, and the general public.
- The study of the physiology of **black bears** has important implications for two **human health issues; chronic depression and osteoporosis.** For example, the blood chemistry of black bears in hibernation is very similar to the blood chemistry of humans suffering from clinical depression, yet the bear has the ability to shift almost instantly from this subdued state to a fully alert and functioning organism. Understanding the physiological

processes that facilitate this rapid transformation has implications for the treatment and prevention of depression in humans. The lack of exercise in humans is an important contributing factor in the bone loss associated with osteoporosis. Black bears do not experience any loss of bone during the several months that they spend in hibernation. Again, understanding the aspects of their physiology that prevents this bone loss from occurring might have significant implications for the treatment of this debilitating condition.

- The **Veterinary Teaching Hospital** at Virginia Tech serves as a primary care and referral facility for sick animals from throughout the region. About 8,000 companion animals and **42,000 agricultural animals** annually are treated through its in-hospital and field service programs.
- **Production management medicine** experts work closely with agricultural producers and commodity groups to share information that can help them **increase the productivity of their herds and flocks** by maximizing the efficiency of their immunology, reproduction, nutrition, and parasitology programs.
- *Brucellosis* is an infectious disease that causes spontaneous abortion in animals and undulant fever in humans. The disease has essentially been eradicated from the U.S. cattle population due to the development of vaccine RB-51 but remains a major problem in many parts of the world. The RB-51 vaccine has quickly established itself as the **global standard of protection against brucellosis**. Using the technology, researchers are now developing multi-valent vaccines that can simultaneously confer immunity to a variety of pathogens.
- The **Laboratory for Neurotoxicity Studies** is one of the nation's leading organophosphate research centers. Organophosphates, a class of compounds commonly used in fertilizers and pesticides, may have long-term damaging effects to the nervous system of animals and humans. The laboratory has received major funding support from the U.S. Army and industry groups to examine the behavioral, biochemical, and pathological effects of these agents.
- Researchers study the molecular mechanism of viral replication and pathogenesis and **developing vaccines against viral diseases**. Recently, a vaccine was developed against porcine circovirus type 2, an agriculturally significant health problem in swine. Viruses currently being studied include the hepatitis E virus (which causes the disease in humans, swine, and birds), other porcine circoviruses, and porcine reproductive and respiratory syndrome virus.
- Equine Extension faculty in veterinary medicine made **22 different presentations on nutrition, lameness, and other topics** in equine health at producer meetings, conferences, and short courses sponsored by organizations including the Virginia Horse Council and the Virginia Forage and Grassland Council during the 2007-2008 academic year.
- Beef and Dairy Extension cattle faculty in veterinary medicine made **49 different presentations** on beef and dairy reproduction, disease prevention, quality assurance, and other topics during producer conferences, field days, and short courses sponsored by organizations such as the Virginia Cattleman's Association, breed association meetings, and other producer gatherings.
- With the growing depletion of natural fisheries around the world, many experts look to **aquaculture** as the way to ensure that fish remain a viable nutritional resource for human diets in the future. Yet the dense fish populations associated with most aquacultural production technologies are very susceptible to infectious disease threats. These threats as well as management problems facing the finfish and shellfish industries are addressed in the aquatic medicine program.

- Human asthma is a disease of growing importance in the U.S. and throughout the world. Horses develop a disease that is very similar to asthma called recurrent airway obstruction (RAO). Researchers study RAO-affected horses to develop a better understanding of **airway disease in both horses and humans**. They are investigating the signals that initiate airway inflammation in RAO horses, trying to determine if changes in the composition and function of airway secretions contribute to the development of diseases like equine RAO and human asthma, and searching for improved treatments.

Benefiting the green industry and homeowners across the state

- Researchers found that moving the water intake location in **commercial nurseries** away from the runoff reservoir is a simple way of controlling a disease (*Phytophthora* species) commonly found in irrigation water. This has benefited the environment and decreased fungicide expenses for growers, resulting in a significant savings.
- **From home gardens to erosion control and food production, the Virginia Master Gardener Program** nets more than 250,000 volunteer hours and reaches more than 500,000 Virginians each year with timely, accurate, and educational horticulture information to increase their quality of life and become better stewards of the environment. It is one of the most successful Extension volunteer-based programs in the state with more than 4,000 volunteers providing in excess of 250,000 hours of teaching about horticultural practices. **Their time equates to approximately \$4.7 million in support.**
- Virginia Tech researchers lead promotion efforts of newly released cold-tolerant bermudagrass cultivars. Golf courses and other outdoor sports venues adopting these recommendations can save at least six months of revenue and reduce seed costs by more than \$30,000. Annual **maintenance costs of bermudagrass fairways** in the commonwealth are estimated at \$370/ha compared to \$5,120/ha for cool-season grasses, which are less drought- and disease-resistant.

Revitalizing Virginia's communities to become thriving environments for its citizens

- Virginia Cooperative Extension's Community Viability program promotes and sustains **vibrant economies, healthy and safe environments, and social well-being throughout Virginia**. Its foundation is a collaboration among entrepreneurs, local businesses, industry leaders, trade organizations, local and state governments, and research and Extension faculty.
- The delivery of a **certification program for county elected officials** by Extension and the Virginia Association of Counties has resulted in participants learning more effective personal performance, enhanced board effectiveness, and enhanced county government.
- Through their farm-to-fork opportunities, **community-based food programs** provide social and economic value to communities and focus on food and nutrition as added benefits to participating areas. In the Shenandoah Valley, Extension has worked directly with Harrisonburg City public schools, James Madison University, Eastern Mennonite University, Rockingham Memorial Hospital, and Washington and Lee University to make fresh local food and produce available and accessible to these institutions.

- The **Southside Forest Products Initiative**, a regional educational platform in Southside Virginia focused on human capital development through a partnership with area high schools, community colleges, the Southern Virginia Higher Education Center, and Virginia Tech. In 2008, more than 145 participants from public and private sectors throughout the region participated in a conference. The first two WoodLINKS sites in Virginia were established in South Boston and Danville. The initiative just received a \$6 million grant from the Tobacco Commission to continue its efforts in the region.

Improving environmental quality in the commonwealth

- Extension agents and specialists throughout the commonwealth promote the use of **no-till crop production** where feasible. College researchers have proven that compared to conventionally tilled fields, no-till fields show:
 - Losses of sediment reduction by 99 percent,
 - Nitrogen reduction by 94 percent, and
 - Phosphorus reduction by 92 percent.
- Across the state, an increasing number of Virginians buy small properties and place horses on the land. Without background or experience with **land stewardship, new horse owners** inadvertently contribute to water supply contamination, erosion, weed proliferation and spread, and other environmental problems through poor land-management practices. Virginia Cooperative Extension efforts educate new horse and landowners on sound land-management practices.
- Urban stormwater runoff into the Chesapeake Bay accelerates the decline in water quality due to residues of fertilizers, pesticides, and herbicides it carries. The Turf Love program is a community-based water-quality improvement education program that helps protect water resources and the quality of the landscape. Through public workshops and home visits, the Turf Love program educates landscape professionals and homeowners on producing healthy turf while **reducing chemicals in urban stormwater runoff that contribute to water pollution of the Chesapeake Bay.**
- Environmental problems that can occur as a result of **coal surface mining** are most efficiently remedied with best management practices. Working with the coal industry and state and federal regulators, researchers have evolved a suite of guidelines that help prevent the sedimentation and other water quality problems associated with surface mining and also provide approaches that allow **mined land to be returned to productive land use** once mining has been completed.
- Sedimentation and changes in water chemistry due to land disturbance in the coalfield region of Virginia lead to the decline or elimination of many populations of **freshwater mussels**. Freshwater mussel restoration research has determined how to rear and reintroduce mussels into many of Southwest Virginia's streams. Returning these important filtering organisms to streams is an important step in addressing the need to **improve water quality.**

Enhancing and diversifying the state's natural resource based industry

- Virginia's forest products industry contributes more than \$25 billion annually to the state's economy. In addition to the direct economic impact, Virginia's forests contribute to the state in many other ways, including protection of water quality. The Virginia Sustainable Harvesting and Resource Professional (**SHARP**) **Logger Program** provides **training to loggers in sustainable forestry, workplace safety, and environmental protection**. These trained loggers represent the vast majority of wood produced in the state. In 2007, 1,045 individuals received SHARP logger credit.
- Through **Virginia's Master Naturalist Program**, volunteers provide education, outreach, and service dedicated to the conservation and management of natural resources within their communities. Sponsored by Extension, the Virginia Departments of Game and Inland Fisheries, Conservation and Recreation, Forestry, and the Virginia Museum of Natural History, this volunteer-based program fosters the appreciation for our natural resources and creates behaviors and projects that help restore, conserve, and monitor our woods, wildlife, and water. In 2006-2007, **500+ individuals provided more than 19,000 volunteer hours, valued at \$356,630**. The educational programs reached more than 15,000 youth and adults, and their on-the-ground efforts positively impacted many acres of land and miles of trails.
- Of the **15.8 million acres of forestland in Virginia**, 13.0 million acres are privately owned, with the single largest owner category being 384,000 individuals or families (10.1 million acres). The Virginia Forest Landowner Education Program targets non-industrial private landowners to enhance their forest management skills. In 2007, 466 students, owning more than 4,000 forested acres, attended short courses coordinated through the Virginia Forest Landowner Education Program. These **students estimated having taken these courses would help them earn an additional \$300,000 dollars from forest management activities**, and 65 percent indicated they would seek professional forest management assistance in the future.
- The **Forest Nutrition Coop** provides funding to support needed research on the impacts of fertilizer additions to forest plantations. Coop research provides information to land owners that allows informed decisions on the economic viability and potential yield increase anticipated as a result of fertilizer additions.
- The **Growth and Yield Coop** develops mathematic models that can be used by the industry to **project the growth and potential yield of wood fiber** based on a variety of growth factors. This information can be used in a number of investment scenarios as a means to project potential income.
- Catastrophic failures of commercial and residential decks have led to both death and serious injuries. Wooden deck construction research has developed guidelines to promote **safe deck construction practices** thus preventing future deck failures and further deaths or injuries.
- The **Virginia Geospatial Extension program** developed a geospatial metadata training program for local governments and state agencies. This training effort represents a value of approximately \$100,000 if it had been conducted by the private sector. As of December 2007, 53 geospatial metadata records had been posted to the Virginia Geospatial Metadata Clearinghouse. These metadata records represent 51 geospatial data insurance policies. The **estimated development cost** associated with the geospatial data for which these metadata have been developed well **exceeds \$5 million**, posing a significant benefit to local governments and state agencies.