

2014 Annual Report

Agency 229

Partners for Progress

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Virginia Agricultural
Experiment Station

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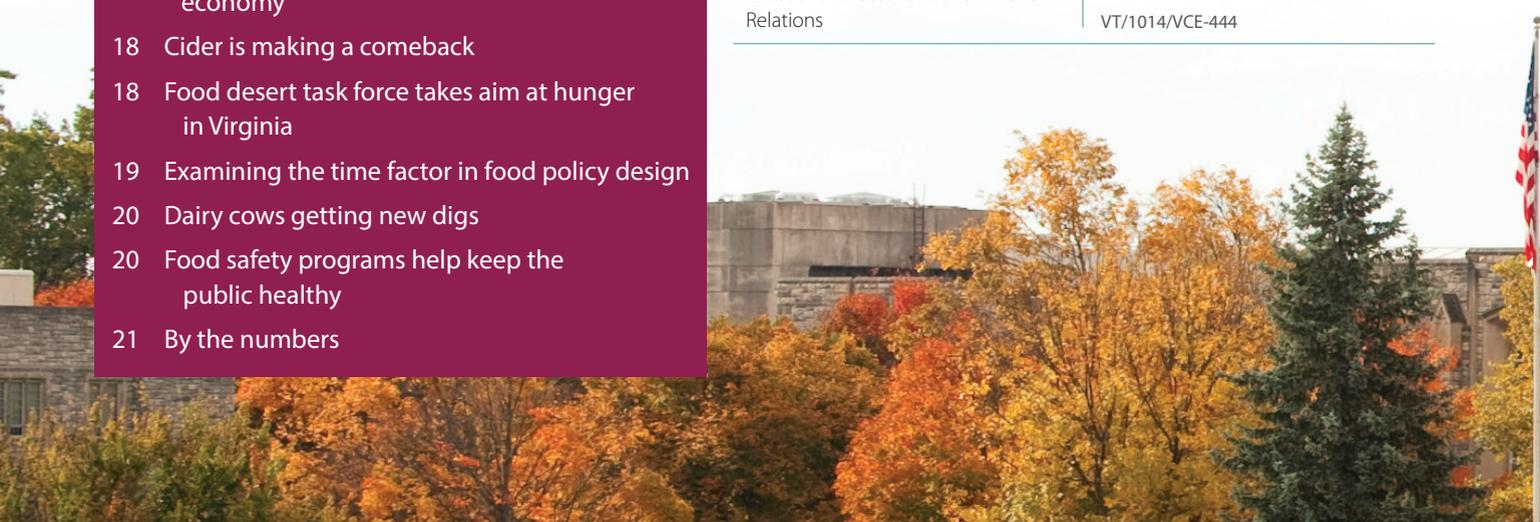
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A message from President Sands

Anniversaries, especially those 100 years in the making, offer a great opportunity to reflect on one's accomplishments.

In 2014, we celebrated the Smith-Lever Act, which established the national Cooperative Extension Service. A unique educational partnership between the U.S. Department of Agriculture and the nation's land-grant universities, Cooperative Extension extends research-based knowledge through a state-by-state network of extension educators.

Over the past 100 years, Virginia Cooperative Extension has worked hand in hand with researchers and scientists located at the Virginia Agricultural Experiment Station, the Blacksburg campus, and the 11 Agricultural Research and Extension Centers to stimulate innovative research and to provide vital educational programs for youth and adults that help to improve the quality of life and economic prosperity in Virginia.

This work could not have been possible without the continued support of our federal, state, and local partners. The strength of these partnerships has enabled us to expand our programs while keeping them relevant and dynamic. In collaboration with our sister land-grant university, Virginia State University, we are able to make a greater impact across the commonwealth and reach many more Virginians.

Whether we are developing the next peanut variety, encouraging young people to expand their creativity, working to ensure the security of the food supply, or educating beginning farmers, our mission is the same: to help Virginians improve their lives, their businesses, and their communities.

Please take a moment to read about how Virginia Cooperative Extension and the Virginia Agricultural Experiment Station are making an impact in communities across the commonwealth. We also encourage you to visit our websites — www.ext.vt.edu and www.vaes.vt.edu — to learn more about our programs and research that are helping to ensure a prosperous future for generations to come.

Sincerely,

Timothy D. Sands
President



Big peanuts *are* big business



In recent years, Bailey, Sugg, Titan, Sullivan, and Wynne have brought millions of dollars into the commonwealth.

These aren't companies or entrepreneurs or even scientists. They are peanuts.

Researchers from Virginia Tech, working in conjunction with partners and peanut breeders in North and South Carolina, have developed and tested a constant stream of new Virginia peanut cultivars over the last 40 years that are as profitable as they are hearty.

"Farmers we work with not only benefit from the work we do, but also help guide our research in terms of telling us what characteristics they would like to see in new Virginia peanut strains," said Maria Balota, a professor of plant pathology, physiology, and weed science who is also an Extension specialist.

It's a very symbiotic relationship that benefits everyone and allows Virginia gourmet peanuts to continue to be the very best that you can find.

— Maria Balota
Extension specialist

The Peanut Variety and Quality Evaluation Program is the only publicly funded program of its kind in the world that focuses solely on peanuts.

The big, gourmet Virginia peanuts are big business in the region. In the banner year of 2012, they had a production value of \$210 million in Virginia, North Carolina, and South Carolina.

Two varieties with extra-large pods that Balota's group has grown — Bailey and Sugg — have added more than \$16 million in value to the crops.

New cultivars are always in the pipeline to help farmers meet the needs of their customers and to develop strains that are disease-resistant.

"This is a great way to have acceptable varieties released because they have been thoroughly tested under real-world conditions," said Dell Cotton, executive secretary of the Virginia Peanut Growers Association.

Beyond the laboratory, Balota spends hours meeting with farmers, shellers, and wholesalers to find out what the market is interested in so she can help provide the most profitable peanut.

"We get opinions from everyone in the peanut industry about what variety should be released and what is needed at the moment," she said.

She is currently working on developing peanuts that are low in linoleic acid, which will help decrease the risk that the peanuts will turn rancid during shipping and storage.

Balota holds field days so that peanut producers can visit her test plots to see what is

working for her and how they can incorporate her findings into their peanut operations.

"It's a very symbiotic relationship that benefits everyone and allows Virginia gourmet peanuts to continue to be the very best that you can find," Balota said.



Extension specialist Maria Balota works with peanut producers to develop the best varieties suitable to the commonwealth's climate.



Helping Virginia's vegetable growers *manage* pest attacks

Vegetable production is growing in Virginia and nationwide, with an increased emphasis on locally grown food. However, not all growers, especially those who are new to the field, know how to control the pests that attack their crops. Many of the insecticides that have been used in the past can have damaging health and environmental effects, not to mention the harm they do to other beneficial insects.

To respond to these needs, the Vegetable Pest Management Research Program provides research and education in order to find better solutions.

"Pest management has never been more important than it is today," said Thomas Kuhar, Virginia Tech entomology professor and Virginia Cooperative Extension specialist.

The program identifies which pest problems are the most pressing, such as the brown marmorated stink bug, and finds alternative ways to control them. Kuhar and other researchers and Extension agents use this research to educate growers and the public.

"We deliver this information to growers in the state through a number of avenues. There are several field day meetings that go on in the Shenandoah Valley,

Eastern Shore, Northern Neck, Richmond area, and the southwestern part of Virginia," Kuhar said. "We also update the pest management guides that the growers can get each year that advise them on how to manage pests."

The program's work has made a marked difference on vegetable production in the commonwealth, giving Virginia an advantage over other states. For example, growers nationwide have been struggling with the Colorado beetle, an invasive species that wreaks havoc on potatoes. In many states, the beetles have developed resistance to certain insecticides, making them even harder to control.

"By educating growers and evaluating different tools

The program's work has made a marked difference on vegetable production in the commonwealth, giving Virginia an advantage over other states.

Colorado potato beetle

that manage the insect in Virginia, our growers have not had insecticide-resistance problems of that insect; therefore, our potato growers have been able to effectively and economically provide control of that difficult pest," Kuhar said.

In the coming years, the program will be developing sound integrated pest management plans for the most important pests in Virginia. By spreading awareness and education, the program directly helps the farmers and, therefore, the commonwealth at large.

"The impact is that the growers are more knowledgeable and can provide better and more environmentally sound control of the pests that attack their crops," said Kuhar.





Virginia Tech *reinvigorates* the aging farming population

The farming industry is no small potatoes for the commonwealth. Agriculture is the state's largest industry, with a national economic impact of \$52 billion annually — a figure that is growing every year. Meanwhile, Virginia's agricultural and forestry exports have increased to nearly \$3 billion annually.

But what is also increasing is the age of the state's farmers. The average age of a Virginia farmer today is 59.5 years old, compared with a nationwide average age of 50 in 1978. And that aging population may threaten the state's ability to keep up with the demand for agricultural products at home and abroad.

Virginia Cooperative Extension is keeping farming at the forefront of the commonwealth's economic engine and

social fabric by developing innovative outreach programs.

Kim Niewolny, an assistant professor in the Department of Agricultural, Leadership, and Community Education and an Extension specialist, is the director of the Virginia Beginning Farmer and Rancher Coalition Program. The program is the first beginning farmer learning network in Virginia. It serves as a conduit — not only to educate, but also to connect organizations and individuals with each other in order to encourage a transfer of agricultural knowledge. The program received a \$740,000 grant from the USDA and was created to reverse the steady decline in the number of people entering farming.

"We not only provide high-quality educational resources and experiences for a diversity of beginning farmers and ranchers, we also focus on building partnerships with educators and service providers to coordinate and enhance referral services and technical assistance," Niewolny said. "As a coalition, we are creating shared measures of success so we can make the best impact today and for years to come."

Farmers Casey Bartok and her husband, Justin Wisch, both 28 years old, were able to fast track their Loudoun County farming operation, Long Stone Farm, because of assistance they received from the program.

"It was during the beginning

“The whole-farm planning curriculum helped us develop a holistic plan that includes the production of beef cattle, heritage pigs, and a mixed berry and fruit permaculture orchard system.”

— Casey Bartok

www.vabeginningfarmer.org

farmer class that we were able to piece together the farm-business puzzle. The whole-farm planning curriculum helped us develop a holistic plan that includes the production of beef cattle, heritage pigs, and a mixed berry and fruit permaculture orchard system," said Bartok. "We would not be at the stage we are now if it weren't for the curriculum of the Beginning Farmer and Rancher Coalition Program because I wouldn't have been able to figure out the business plan as quickly and as thoroughly."

The faces of Virginia's farmers might be changing, but programs like the Beginning Farmer and Rancher Coalition are making sure Virginia agriculture keeps hitting its mark.

Extension recruited in the fight *against* boxwood blight

Boxwoods are the mainstays of landscapes in many historical sites across the commonwealth as well as an important nursery crop. The annual wholesale market value for boxwood nursery production is \$103 million.

“The boxwood is not just a plant. It’s part of Virginia’s cultural heritage,” said Chuanxue Hong, Extension specialist in ornamental horticulture at the Hampton Roads Agricultural Research and Extension Center.

However, growers and researchers are concerned that boxwood blight could potentially decimate English and American boxwood populations along the East Coast if precautions to curb the spread of the disease are not followed.

Boxwood blight is caused by a fungal pathogen that renders the plant’s leaves brown and dry. The fungus can rapidly defoliate boxwood plants, making the plants unsuitable for commercial sale, leading to plant death, and wiping out ornamental landscapes. The disease spreads primarily via plant materials and soil from infected plants. The pathogen produces sticky spores that attach to plant containers, tools, vehicles, and shoes and clothing.

Since the initial outbreak in Carroll County in 2011, the disease has spread to the Richmond and Northern Virginia areas in addition to several other counties across the state. “We have moved from trying to contain the disease to managing it,” said Hong, who is also a professor of plant pathology.

In order to help prevent widespread destruction of boxwoods, researchers have asked the public to take precautions when installing new plants, pruning existing plants, and maintaining plants at household and historical landscapes.

In an effort to understand the disease and take preemptive measures against the blight, Hong and other Virginia Tech researchers have partnered with several institutions, including North Carolina State University, Rutgers University, Oregon State University, the USDA Agricultural Research Service, and the USDA Animal and Plant Health Inspection Service’s Plant Protection and Quarantine program.

In addition, the Virginia Department of Agriculture and Consumer Services and Virginia Cooperative Extension have partnered to form a task force to educate the public about boxwood blight. The task force developed a website

(www.anr.ext.vt.edu/nursery/boxwood-blight) for commercial growers, landscapers, greenery producers, and homeowners that provides best management practices for mitigating the blight, along with other helpful resources.

“The boxwood is not just a plant. It’s part of Virginia’s cultural heritage.”

— Chuanxue Hong
Extension specialist,
Hampton Roads
Agricultural Research
and Extension Center



Farm to Fork

Connecting farmers to consumers



Connecting all the supplier and distribution dots for consumers and producers to enjoy the benefits of the farm-to-fork movement can be challenging, but Virginia Cooperative Extension is doing just that in the commonwealth.

“When you think about local foods, a starting point for most people is farmers markets, community supported agriculture programs, or community gardens,” said Eric Bendfeldt, community viability Extension specialist. “We want to try and support other initiatives, like farm-to-school and farm-to-university. We also want small to midsize farmers to get into more retail outlets.”

The Virginia Farm-to-School Week initiative, which started in 2009, is a collaborative effort among Virginia Cooperative Extension, the Virginia Department of Agriculture and Consumer Services, and the Virginia Department of Education to increase the amount of fresh and nutritious Virginia-grown products offered in schools. The initiative is a way to promote opportunities for schools and local farmers to work together. It also connects nutrition directors with farmers and the Department of Education.

When the Harrisonburg City Public School System began participating in the program in 2009, it allocated 10 percent of its budget, or \$9,000, to the local foods program. Now it allocates a whopping \$100,000 to the initiative.

And it's not just through schools that local produce and food products are finding their way onto plates. Virginia Cooperative Extension has been instrumental in bringing foods produced in rural parts of the state to retailers in the more urban areas of the commonwealth.



For example, a group of Shenandoah Valley beef producers recently started the Shenandoah Valley Beef Cooperative to increase sales opportunities and create awareness of its stewardship practices. Virginia Cooperative Extension helped the co-op market its beef products to consumers as high quality, natural, and certified, using the Beef Quality Assurance program as well as a website (www.shenandoahvalleybeefcoop.com) that is used for marketing. The website tells the story of the families who produce the beef, their humane farming practices based on livestock consultant Temple Grandin's ranching philosophy, the stewardship of land, and the generations of farmers who have worked the land.

Extension has played a critical role in making other retailers aware of the co-op.

When the co-op first started, it was selling one or two animals per week. Now the co-op sells 10 to 15 animals per week and counts the Washington metropolitan restaurant chain Clyde's as one of its clients. Soon, the co-op will be selling its beef products to the Washington Nationals baseball team.



Shenandoah Valley beef producers build awareness of their stewardship practices through their marketing cooperative.

When the Harrisonburg City Public School System began participating in the program in 2009, it allocated 10 percent of its budget, or \$9,000, to the local foods program. Now it allocates a whopping \$100,000 to the initiative.

A fine kettle of fish

Some reports estimate that the U.S. imports as much as 90 percent of its seafood, making the trade deficit for seafood second only to oil among natural resource deficits in United States.

The research being conducted at the Virginia Seafood Agricultural Research and Extension Center in Hampton could change that. Not only does the research encourage growth of Virginia's aquaculture industry, it also helps to maintain a safe seafood supply nationwide.

Virginia has seen particularly strong growth in the oyster industry and produced more than 500,000 bushels in the last year — a quantity that represents a 25 percent increase over the previous year and has not been seen in almost a generation.

One focus of researchers at the Virginia Seafood AREC is the control of pathogens, such as vibrios, in raw oysters.

These potentially deadly pathogens are naturally occurring and peak in the summer months when water temperatures rise. Vibrios are the main cause of illness from raw oyster consumption, and the mortality rate from vibrio poisoning can be as high as 50 percent.

"We are looking at some lower cost measures to

eliminate vibrios in raw oysters by using salinity in water to lower vibrio levels," said Mike Jahncke, director of the Virginia Seafood AREC.

By placing oysters in recirculation tanks with salinity, researchers have reduced vibrios to levels that are safe for human consumption.

Finfish are another focus at the AREC and are of critical importance to maintaining food security in the United States. Finfish not only provide protein for human consumption, they also provide fishmeal to feed fish. Increasingly, the lack of available fishmeal to feed farm-raised fish is a concern for producers and threatens the global supply of seafood.

Researchers at the Virginia Seafood AREC conduct aquaculture nutrition research that uses plant-based fish feed rather than scarce fish meal to help producers increase production in an economically viable and sustainable way.

The nutrition studies measure how much feed is necessary

Virginia has seen particularly strong growth in the oyster industry and produced more than 500,000 bushels in the last year.



for the fish and also how and what to finish the fish with. Like farmers who finish cattle on grain, researchers at the Virginia Seafood AREC study how to maximize finishing feed to make fish palatable to consumers in texture, taste, and color.

Mike Jahncke works with a Virginia Tech student at the Virginia Seafood AREC to find ways to increase aquaculture production around the state.



Maker program encourages kids *to be creative*



While the robot that 12-year-old T.J. Handy made at Maker STEM camp worked perfectly fine indoors, it struggled to move over the sandy terrain when he took it outside. Instead of getting frustrated, T.J. simply went back inside, adjusted the robot's suspension, and tried again. This time, it worked.

Handy is one of the 22 middle school students who participated in Maker STEM camp at the Georgetown School in Hanover County, Virginia, last summer.

Maker is an after-school and summer camp program put on by 4-H. Trained adult leaders teach students the principles of STEM — science, technology, engineering, and math — through a learn-by-doing philosophy. Maker coaches lead campers through demonstrations

Maker STEM camp participants build and test electronic circuits to run small engines.

on the day's lesson, such as robotics. Then, the campers create their own models. The coaches encourage creativity and try to eliminate the fear of failure. This enables students to look at problems they run into as challenges to overcome, rather than as failures.

"The kids look at troubleshooting as just another part of making," said Rita Schalk, 4-H youth development Extension agent in Hanover County.

Hanover County was one of the first four 4-H groups across the nation to receive funding for Maker two years ago. Currently, there are 4-H

Maker programs in nine counties in Virginia and at least four more localities expect to have programs within the year. Also on the horizon are Maker festivals — events where participants can learn about and try out the projects created by Maker volunteers.

In the program's first year at the Georgetown School, it had a significant impact on the children. According to Kathleen Jamison, 4-H youth development Extension specialist, the children entered the program "withdrawn and somewhat resistant." As time progressed, however, they "reached the tipping point of total engagement" and excitement for making projects and learning.

"They were actually making things and creatively evolving new applications for alternative energy, electronics, and robotics. It was wonderful to see this happen," said Jamison.

The students' interest and self-efficacy in STEM subjects has also translated into the classroom. According to Schalk, they were more engaged in school and eager to apply their knowledge and experiences.

Despite the success of its first year, the Maker program was almost discontinued in Hanover County. Originally,

“They were actually making things and creatively evolving new applications for alternative energy, electronics, and robotics. It was wonderful to see this happen.”

— Kathleen Jamison
4-H youth development
Extension specialist

the company that funded the Maker program, Cognizant Solutions Inc., only intended to fund the pilot year of the program.

"They were not going to fund us a second year because they only offered these grants to set pilot programs into motion. Rita Schalk's telling of the kids' story was so compelling, however, that they gave Hanover another year of funding," said Jamison. "Maker is alive and well in Virginia 4-H. It is my hope that Maker education will provide opportunities across the state for children to explore their creativity and their ability to create new products, processes, and philosophies about learning and doing."

Master Gardeners *help extend* Extension's reach

At more than 5,500 strong, Virginia's Master Gardeners are making an impact in communities across the commonwealth.

Master Gardeners can usually be found in the middle of any community garden project. They share their knowledge with the public through plant clinics and educational programs. They develop and maintain demonstration gardens and provide garden tours. They also set up plant clinics at farmers markets and staff horticulture help desks at local Extension offices.

While not all of Virginia's citizens actively seek help from Master Gardeners, everyone in the commonwealth can benefit from their efforts. Even a small group of people that learns and implements best management horticulture practices that help sustain the environment will improve the viability of all of Virginia.

"If a particular neighborhood pays attention to its lawn care practices, it's going to have an impact on that particular watershed and eventually have a positive impact on the Chesapeake Bay. The entire commonwealth receives public value from those actions, even though it's a small segment of people that is directly involved in the work," said David Close, state Master Gardener coordinator.

Part of what makes the program so successful is the leadership and initiative displayed by the volunteers. Most Master Gardener projects have come from the vision of volunteers who saw a need in their community and found a way to fill it.

Lynn Brammer, a Master Gardener and co-president of the New River Valley Master Gardener Association, exemplifies this mindset. In 2010, Brammer initiated the Share the Spare program at the Blacksburg Farmers Market, a booth where patrons and vendors can donate their extra produce for the hungry and ask questions about horticulture. Another of Brammer's favorite projects has been donating raised garden beds on wheels to a retirement home, which allows senior citizens to garden in their rooms.

"Senior citizens who are no longer in their own home with their own yard are excited to plant a geranium. It brings a light to their eyes as they remember what they used to do before being restricted by their circumstances," said Brammer. "Every project we have done positively affects someone in the community."



“Every project we
have done positively
affects someone in
the community.”

— Lynn Brammer
Master Gardener and
co-president of the
New River Valley Master
Gardener Association

Master Gardener Mary Ann Kincaid, of Virginia Beach, helps to maintain the gardens at the Hampton Roads Agricultural Research and Extension Center.

complete a minimum of eight recertification hours and 20 community service hours annually. According to Close, the volunteers are strongly motivated by their love for gardening, the environment, and their communities.

Master Gardeners have also established gardens at juvenile detention centers, giving those youth something positive and productive to focus on, and at libraries and museums.

To become a Master Gardener, individuals must complete a minimum of 50 hours of training and conduct at least 50 hours of community service in the first year after training. After that, they must

"There is intrinsic value in what they do, and I think that's the motivating factor behind what keeps most of these volunteers engaged. Most of these folks are also very passionate about the communities in which they live, so this is one way for them to give back to their community and to Virginia Cooperative Extension as an overarching system," said Close.

Agency 229 *is ...*

Innovative research



Virginia Agricultural Experiment Station's network of faculty members in Blacksburg represents three colleges — the College of Agriculture and Life Sciences, the College of Natural Resources and Environment, and the Virginia-Maryland College of Veterinary Medicine. The 11 Agricultural Research and Extension Centers located across the state support basic and applied research activities on agricultural, environmental, natural, and community issues related to the future needs of Virginia, the nation, and the world.

Expanding education



Extension offers resources in 107 offices located in every county and 12 cities in Virginia. It is a product of cooperation among local, state, and federal governments in partnership with tens of thousands of citizens who — through their local Extension Leadership Councils — help design, implement, and evaluate Extension's needs-driven programs.

We have the commonwealth covered

- 107 Local Extension Offices
- ◆ 11 Agricultural Research and Extension Centers
- ▲ 2 Departmental Research Centers
- 6 4-H Educational Centers
- ★ Virginia Tech, Blacksburg Campus
- ★ Virginia State University, Petersburg



A local presence



Virginia Cooperative Extension leads the engagement mission of Virginia Tech and Virginia State University — the commonwealth’s land-grant universities. By building local relationships and collaborative partnerships, Extension provides practical education you can trust to help people, businesses, and communities solve problems, develop skills, and build better futures.



Finding answers to honeybee colony decline

The popular saying celebrating the importance of agriculture, “No Farms, No Food,” could easily shift to “No Bees, No Food” if solutions to the honeybee decline are not found.

Which is why Troy Anderson, Virginia Tech insect toxicologist, is making inroads toward understanding why the honeybee — the most widely managed crop pollinator — is disappearing in droves.

While pesticides have been implicated in the reduced number of bee colonies available for crop pollination services, several gaps remain in the knowledge about pesticide exposures and the health status of bees in order to understand the decimation of these pollinators. Anderson’s team uses a multidisciplinary approach to study bee decline, including pesticide residue analysis, nutrition and immune physiology, and population dynamics modeling.

“We need to gather information where knowledge is lacking to predict conditions that are favorable or unfavorable for bee health,” Anderson said. “Our research is being translated into management practices to reduce bee losses for the apiculture and agriculture industries. These practices will not only minimize annual losses of bees; they will also improve the health of these pollinators and enhance crop pollination services.”

Understanding diseases in order to stamp them out

Millions of people worldwide suffer from tuberculosis, Chagas disease, and fungal infections, yet current treatment is expensive and minimally effective.

To combat these diseases, researcher Pablo Sobrado is developing drugs that may be able to help stop the illnesses in some of the poorest parts of the world.

“Our work is focused on understanding these diseases so that we can develop treatments that are not only effective, but affordable,” Sobrado said.

In addition to operating an infectious disease research program, Sobrado also serves on the steering committee of Virginia Tech’s Center for Drug Discovery and as the director of the center’s screening lab, located in the Fralin Life Science Institute. Formed in 2012, the center’s mission is to accelerate research that could lead to new treatments for cancer, Alzheimer’s disease, tuberculosis, fungal infections, cardiovascular disease, atherosclerosis, diseases of the central nervous system, and parasitic diseases such as malaria and Chagas disease.

The screening lab provides expertise in development, application, and analysis of high-throughput screening



Pablo Sobrado is working on vaccines that could benefit people in the poorest parts of the world.

assays for the identification of compounds with specific biological activity, such as enzyme or cell growth inhibition. The lab also enables chemists who have prepared hundreds to tens of thousands of compounds to test them for bioactivity against a variety of disease models and compare them against commercial chemical libraries or libraries of compounds from in-house research.

“Our main goal is to help the Virginia Tech community acquire preliminary data and provide the technical support to make their grant proposals more competitive,” said Sobrado. “Before the establishment of the screening lab, Virginia Tech scientists had to seek help from other centers or research groups out of state.”

Building a better chicken

Herbert Hoover’s presidential campaign once promised a chicken in every pot, but Elizabeth Gilbert is taking that promise a step further — she wants to ensure it’s the most nutritionally balanced chicken in the pot.

An assistant professor of animal and poultry sciences, Gilbert is helping Virginia poultry producers maximize chicken production to get the most meat they can from their birds. Poultry was a top agricultural export for the commonwealth in 2013, exceeding \$186 million.

Gilbert studies fat tissue development and epigenetic regulation of gene expression in chickens. Epigenetics is the gene activity not related to DNA. She is looking at the role of neuropeptides in fat deposition and how the dietary composition of fat, carbohydrate, and protein influences the accumulation of fat.

“Understanding factors regulating subcutaneous fatty connective tissue development may have profound implications for the broiler industry,” Gilbert said. “By providing information that can affect body composition, we can help increase the quality of the meat in the birds and boost profits.”

In order to study adipose tissue development, Gilbert uses the two lines of White Plymouth Rock chickens developed by Paul Siegel, University Distinguished Professor Emeritus of Animal and Poultry Sciences. In every generation since 1957, Siegel has bred the heaviest and lightest chickens within their respective lines, thus establishing high body weight and low body weight groups.

These lines of chickens have been in existence for more than 50 years and serve as a powerful genetic resource. The low body weight line contains some anorexics, and the chickens are relatively lean, whereas the high body weight line contains compulsive feeders that develop excess body fat at an early age.



Growing ornamentals and profits

Jim Owen has his sights set on three goals when it comes to helping nursery growers.

One-third of his research and Extension work focuses on ways he can help growers save money while protecting the environment in the immediate future by reducing the amount of water used on plants. Another third of his work looks at giving nurseries the tools they can use two and three years down the road. The final third centers on developing long-term strategies to keep the nursery industry profitable for the long haul while dealing with new environmental regulations coming down the road.

"We are working on a solution to help nursery growers in Virginia and around the country maintain their high standards of quality while helping improve the water quality of the Chesapeake Bay and beyond," said Owen, an associate professor of horticulture who works at the Hampton Roads Agricultural Research and Extension Center.

Phosphorus pollution in the bay is a serious issue, and farmers are being asked to curb the amount of fertilizers coming from their land. Nurseries are now asked to voluntarily contain 95 percent of the water they use on-site in order to curb runoff phosphorus into the bay.

The horticulture industry ranks fifth in agricultural commodities in the state with more than \$250 million in annual sales.

The horticulture industry ranks fifth in agricultural commodities in the state with more than \$250 million in annual sales, and Owen wants to help nursery growers remain competitive in the years to come.

One of Owen's studies uses remote moisture sensors in plants to determine how much and how often plants need to be watered. By zeroing in on exactly how much water is needed, nursery growers can reduce the amount of money they spend on irrigation. It will also help them comply with the new regulations.

Owen has also been testing exactly how much fertilizer various ornamental plants need so that farmers don't overapply the precious and expensive resource.



While his work will directly benefit the hundreds of nurseries around the state, Owen believes that Virginia can be a leader in terms of helping both the horticulture industry and the environment.

Associate Professor Jim Owen works at the Hampton Roads Agricultural Research and Extension Center on ways to reduce the amount of water that producers need, which boosts profits and protects the environment.

Protecting Water

In the coming years, it may not be fuel or even food that is the world's most precious and valued resource — it may be water.

The number of people who live in areas with water scarcity is expected to increase from 1.6 billion today to 2.8 billion by 2025, according to the World Bank. In order to meet the water shortage challenges and mitigate the anticipated impacts of climate change, Virginia Tech has hired a “cluster” of new faculty that can tackle water issues head-on.

The faculty members from a number of different colleges will complement Virginia Tech's existing water science expertise by exploring interdisciplinary subjects as diverse and complex as water itself, including the effects of climate change on agriculture, management of water and natural resources, transport of chemicals to surface water and groundwater, and development of decision-support tools to mitigate the negative impacts of human activities.

Seven faculty members have been hired in the College of Agriculture and Life Sciences and the College of Natural Resources and Environment as part of the cluster.

“These new positions will effectively integrate our research, education, and Extension programs and allow us to conduct interdisciplinary programs by bridging water science and engineering with social sciences to more effectively address global water issues,” said Saied Mostaghimi, associate dean of research and graduate studies in the College of Agriculture and Life Sciences.

Researchers and students from Virginia Tech are working on new ways to protect our valuable water resources.



Environmental restoration project looks *toward* the **future**

When the seeds of the Powell River Project were planted more than 30 years ago, there was scant science on how to best restore lands disturbed by coal mining, much less any longevity of scientific research on the subject.

Three decades later, the Virginia Tech project has not only yielded groundbreaking research on how to restore natural processes to landscapes in southwestern Virginia coal country, it has also produced evidence that has led to new reclamation practices that help repair the natural environment around the country. Now a new generation of scientists is examining issues including stream reconstruction, invasive species, microbial ecology, and carbon sequestration, among others.

The Powell River Project Research and Education Center is an 1,100-acre site in Wise, Virginia, owned by long-term research sponsor PVR Partners L.P. It has been studied by Virginia Tech researchers since 1980. Research has also occurred at other mine sites throughout Virginia's coalfields and beyond.

"The research that has gone on at Powell River since 1980 has led to some of our nation's most important discoveries in mine restoration," said Paul Winistorfer, dean of the Virginia Tech College of Natural Resources and Environment and chairman of the Powell River Project's board of directors. "We are not only building upon this great work, but we are also looking ahead to tackle emerging challenges in this vitally important field that advances the science of sustainability."

Over the years, a cadre of interdisciplinary scientists from Virginia Tech's College of Agriculture and Life Sciences, College of Natural Resources and Environment, and the Virginia-Maryland College of Veterinary Medicine, as well as others working at the site, have broken new scientific ground on everything from forestry and soil reconstruction to water quality and the creation of wildlife habitat.

"In terms of integrated mined land reclamation research, the Powell River Project's mix of investigators is the best in the



For more than 30 years, researchers have been working in the coalfields in Southwest Virginia to find ways to reclaim the landscape and return it to a natural state.

world," said W. Lee Daniels, a crop and soil environmental sciences professor in the College of Agriculture and Life Sciences who started working on the project 33 years ago as a research assistant. "Without a doubt, this is the longest continually and intensively monitored mine reclamation research site in the world."

“In terms of integrated mined land reclamation research, the Powell River Project’s mix of investigators is the best in the world.”

— W. Lee Daniels

Professor of crop and soil environmental sciences

Healing equine injuries *with* help from stem cells

When a horse has a tendon or ligament injury, the results can be career-ending. A researcher at the Virginia-Maryland College of Veterinary Medicine is searching for the best way to use stem cells derived from fat to stimulate the natural repair mechanisms in horses with these types of injuries.

“Stem cells can be used for any type of tissue repair, but my work specifically deals with tendons and ligaments,” explained Dr. Linda Dahlgren, associate professor of large animal surgery in the Department of Large Animal Clinical Sciences. “We use stem cells from adipose, or fat, tissue because it is readily available in any species, it is easy to harvest, and, when cultured, it expands faster than cells derived from bone marrow.”

Stem cells, unspecialized cells that are part of the body’s repair system, are capable of reforming damaged tissues. Regenerative medicine researchers like Dahlgren can harvest stem cells from a horse’s healthy cells and inject them directly into damaged tissues, and they have more than one way of doing this.

“When we use adult stem cells from fat, they can either be ‘fresh’ — so we just isolate them, put them in a syringe, and inject them into the damaged tissue — or they can be cultured in a lab and then injected into the tissue,” said Dahlgren, who is board certified with the American College of Veterinary Surgeons.

Dahlgren’s current research looks at the differences in gene expression between these fresh and cultured adult stem cells derived from fat.

“By knowing the differences in gene expressions, we might someday know if one set of cells is better-suited to repair certain types of damaged tissue,” she said.



Funded through the Virginia Agricultural Experiment Station and Virginia Tech’s Institute for Critical Technology and Applied Science, the research project lays the groundwork for new regenerative medicine techniques to help Virginia’s horse industry address some of the most common types of equine injuries.

Patents help to put research *into* practice



The research conducted at Virginia Tech affords opportunities for researchers to patent their inventions, investigative findings, and other intellectual property while bringing their leading-edge research to an audience beyond the university.

In fiscal year 2014, Virginia Tech had 25 patents issued, seven of which came from the College of Agriculture and Life Sciences — meaning one-quarter of all patents granted to Virginia Tech originated from the college. Patent holders can add value to research initiatives by forming startup companies to incubate ideas.

As a land-grant university, Virginia Tech is committed to finding answers to society’s most pressing problems, whether they are discovering new energy sources, making a sustainable fiber, or reinventing established scientific boundaries. Patenting intellectual property allows faculty members to promote their own research while serving their constituencies.

Justin Barone’s project does more than just turn chicken feathers into plastic — it turns research findings into economic gains for the commonwealth.

Recent new patent holders include:

- Boris Vinatzer, associate professor of plant pathology, physiology, and weed science, recently patented a genome-based naming sequence.
- Justin Barone, associate professor of biological systems engineering, patented a process that takes agricultural waste products — chicken feathers — and turns them into plastic.
- Associate Professor Percival Zhang, also in biological systems engineering, developed a battery that runs on sugar.
- Thomas Kuhar, professor of entomology, patented a method for deterring one of the commonwealth’s most damaging agricultural pests — the brown marmorated stink bug.

Communities join together to build the economy

Unemployment rates are the No. 1 concern for American citizens. The general economy, dissatisfaction with the government, and poor health care follow close behind, as cited in a 2014 Gallup poll. Rural communities in particular suffer from uncertainty about the economy.

Rural counties and communities can often deal with significant economic transitions and reduce uncertainty when they work together as a region while engaging multiple stakeholders, said Scott Tate, a former community viability Extension specialist. However, most rural areas lack such networks.

“So much economic activity happens across county lines, but some regions don’t have a long history of working together. Or, if they do, they don’t always bring the necessary partners to the table. Stronger Economies Together provides an opportunity to map regions, think about who the stakeholders are, and invite new people to the conversation,” said Tate.

Funded by the USDA, the SET program provided two regional teams with tools, training, and technical expertise. Diverse teams of regional stakeholders participated in the 12- to 18-month program, which strengthened the collaborative capacity and economic development knowledge of participants, culminating in a high-quality economic plan for the regions. Community viability specialists from Extension and personnel from partner organizations engaged participants in teambuilding activities and the use of up-to-date data and analytical tools.

Virginia Cooperative Extension and its partners — including the Virginia Department of Housing and Community Development, Virginia Economic Development Partnership, Virginia Tourism Corporation, and USDA Rural Development in Virginia — implemented the program in two Virginia regions: the Northern Neck-Chesapeake Bay area and a section of Southside Virginia.

The Northern Neck-Chesapeake Bay Region Partnership secured implementation funding, established a small business incubator, and developed one of SET’s nationally recognized regional economic plans.

Virginia’s Growth Alliance, which comprises six counties and one city in Southside, established a new economic development partnership, crafted a regional entrepreneurship plan, and better identified regional economic clusters.



“**So much economic activity happens across county lines, but some regions don’t have a long history of working together. Or, if they do, they don’t always bring the necessary partners to the table.**”
— Scott Tate
Former community viability Extension specialist

In both areas, the program successfully built the foundation for job creation, forged new partnerships, and encouraged local government officials to continue working together across municipal boundaries. Both regions participated in the SET national program assessment in September 2014.

“We are very concerned statewide with making sure that we pursue economic development opportunities like Stronger Economies Together to grow the economy in Virginia,” Tate said.

Cider

is making a comeback

The beverage of choice for Colonial Americans is quickly becoming the preferred beverage of a new generation of connoisseurs. Cider, a fermented beverage made from apples, has seen an exponential increase in production in the commonwealth — 850 percent in the last five years. Currently there are eight cideries licensed in Virginia and four more are slated to come online by the end of the year.

Research being conducted at the Alson H. Smith Jr. Agricultural Research and Extension Center in Winchester, Virginia, is helping apple growers in the state meet the demand for production and improve the quality of hard cider in the state.

Recently, Virginia Tech was awarded a planning grant from the USDA's National Institute of Food and Agriculture to identify how best to address the needs of the cider industry.

"This planning grant will help us resolve some of the key production barriers along the whole supply chain, from cultivar to consumer," said Greg Peck, an assistant professor of horticulture and Extension specialist who is one of the principal investigators on the project.

Executing the planning grant will draw on a multidisciplinary team of expertise from the Department of Food Science and Technology, including Assistant Professors Amanda Stewart and Andrew Nielson, who will study the role fermentation plays in mitigating off-odors and negative sensory characteristics in the finished product. They will also evaluate the nutritional value of the polyphenols found in apples and the flavors that are expressed by them in cider production.

Another team member from Virginia Tech is Gustavo Ferreira, assistant professor of agricultural and applied economics, who will assess the marketplace for cider and determine how cider fits into well-established beer, wine, and spirits categories. Other principal investigators come from the University of Vermont, Michigan State, and Washington State.

"Our goal is to really ensure the long-term success of the emerging cider industry in the commonwealth and across the nation," Peck said about the team.



Greg Peck is one of a handful of researchers helping to grow the state's burgeoning cider industry.

Food desert task force takes aim at hunger in Virginia

Agriculture is Virginia's No. 1 industry. But ironically, for a state that produces an abundance of food, the commonwealth has its share of food deserts — areas that offer limited access to fresh, healthy foods.

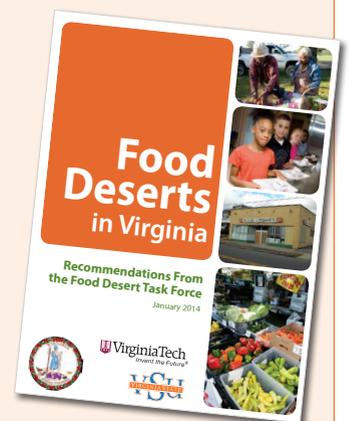
In 2013, a task force led by Dean Jewel Hairston of the College of Agriculture at Virginia State University and Dean Alan Grant of the College of Agriculture and Life Sciences at Virginia Tech took a closer look at food deserts in Virginia to determine their challenges and consequences and to analyze possible strategies and resources to address the issue.

According to the task force's report, more than 1.4 million Virginians — 17.8 percent of the population — live in food deserts. In Lynchburg, the rate is 26.4 percent.

Food deserts, defined by the USDA as areas where residents cannot access affordable and nutritious foods, are usually found in impoverished areas lacking grocery stores, farmers markets, and healthy food providers. Food deserts contribute to food insecurity — the term used to describe when people aren't sure where their food will come from.

"We live in one of the greatest countries in the world, yet 17 percent of our children lack adequate access to fresh foods," said Hairston. "I'd say that's a huge concern."

Some solutions for eradicating food deserts involve employing mobile farmers markets and community kitchens, taking advantage of the existing Virginia Cooperative Extension network to expand its Family Nutrition Program, and encouraging investment in the production of local foods through expanded grant programs.



A PDF of the report, "Food Deserts in Virginia," can be downloaded from the Virginia Cooperative Extension website (<http://pubs.ext.vt.edu/VCE/VCE-294/VCE-294.html>).

Examining the time factor *in* food policy design

More than 46 million people receive benefits from the Supplemental Nutrition Assistance Program (SNAP) — formerly called the food stamp program — to purchase food staples like milk, bread, vegetables, and meat.

Recent research has shown that a typical family receiving SNAP benefits falls short of meeting basic nutritional recommendations, despite having sufficient monetary resources to eat a healthy diet.

As it turns out, time trumps money when trying to achieve nutritional targets, according to Wen You, associate professor of health economics and applied econometrics, and her colleague George C. Davis, professor of health economics and applied econometrics.

“The current SNAP benefit calculation doesn’t specifically take into consideration the time it takes someone to actually cook a meal,” You said. “A single-headed household with the household head working more than one full-time job will struggle to find enough time to shop and cook a healthy meal from scratch.”

You and Davis found that nearly 100 percent of the SNAP participants are “time poor,” which means they do not spend enough time in home meal production — including meal planning, shopping, cooking, and cleaning up — to reach the nutrition goals intended by the SNAP program. The program’s underlying assumption is that the benefit amount will be sufficient for participants to procure low-cost ingredients and produce a nutritious meal.

The researchers have shown that ignoring the time needed for home meal production overestimated the effectiveness of the SNAP program in terms of nutritional goal attainment: about 85 percent of single-headed households produced fewer meals than intended by the Thrifty Food Plan (the base for SNAP benefit calculation). They further calculated the degree of substitution between money and time and confirmed that it is difficult to substitute money for time in home meal production.

You and Davis’ research opens the debate on health and nutrition policy, citing evidence that interventions and policy that focus on monetary resources alone may not be as effective. For example, recent interventions aimed at providing SNAP participants with financial incentives, such

as extra SNAP benefits to purchase fresh fruits and vegetables at local farmers markets, may not achieve the desired behavioral changes. “Increasing affordability of fresh produce is good, but unless participants know what to do with it, how to cook it, and have the time and transportation help to go to the markets, they won’t take advantage of this benefit,” said You.



SNAP-Ed can target the delivery of more education materials that feature time-efficient recipes and information about fresh produce accessibility in recipients’ neighborhoods.

Davis emphasizes that money is only one component of eating healthfully. “To reach a nutritional standard, you have to spend a certain amount of time,” said Davis. “Time does affect your health. If we want people to become healthier, we need to figure out how to make the Thrifty Food Plan less time-intensive.”



“Increasing affordability of fresh produce is good, but unless participants know what to do with it, how to cook it, and have the time and transportation help to go to the markets, they won’t take advantage of this benefit.”

— Wen You
Associate professor of health economics and applied econometrics

Dairy cows getting new digs

Virginia Tech students aren't the only ones getting new living quarters these days.

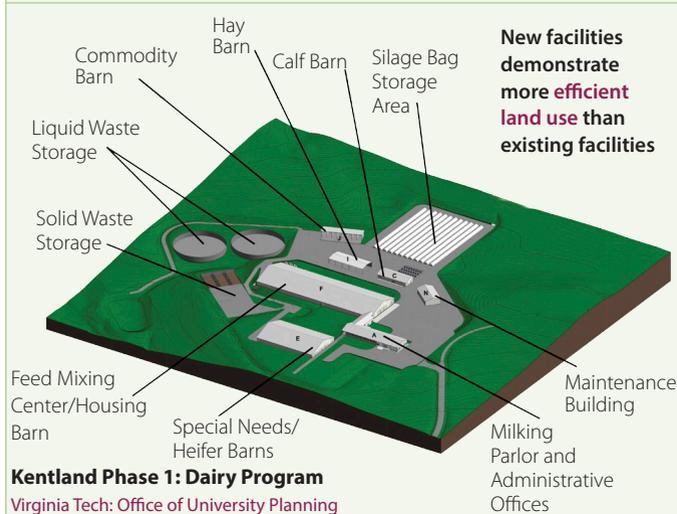
Early next year, the university's dairy cows are moving to new, state-of-the-art facilities near campus — a move that ensures the long-term success of the university's award-winning dairy science program.

Construction is now underway at a 35-acre site at Kentland Farm that can accommodate a lactating herd of 230 and take advantage of Kentland Farm's proximity to feed production and grazing lands. The new buildings should be completed by early 2015.

"This is a great opportunity for the students getting a hands-on education about dairy science, for the scientists conducting research at the new complex, and for the dairy industry, which relies on the applied knowledge that the university provides," said Alan Grant, dean of the College of Agriculture and Life Sciences.

The dairy relocation will make way for the planned growth of the Virginia Tech Corporate Research Center, the expansion of the Virginia Tech/Montgomery Executive Airport, and the construction of a new interchange at Southgate Drive and Route 460. Nongeneral funds and proceeds from the sale of 26 acres of land to the airport authority are covering the cost of the new \$14 million dairy facilities.

The General Assembly has also approved planning money for the next phase of construction, which will include a dairy-focused teaching facility located near Plantation Road, a reproduction facility near campus, and an intensive research barn at Kentland Farm that will focus on metabolism.



Food safety programs help keep the public healthy

Every year, 1 in 6 Americans — 48 million people — get sick from foodborne diseases, according to the Centers for Disease Control and Prevention. Of those, 128,000 are hospitalized, and 3,000 die. The diseases not only cause suffering and hardship for individuals and their families, they also take a toll on the federal and state budgets.

In Virginia, the estimated economic loss from foodborne illness ranges from \$13 to \$25 million annually. Virginia Cooperative Extension's food safety initiative prevents foodborne illnesses, thereby reducing their cost to the public and the government.

"If a manager or someone goes through our program and prevents foodborne illness, then there's a dollar value," said Renee Boyer, Extension specialist and associate professor of food science and technology. "I think it's important to know that Extension agents across the state are trained to deliver these training programs, and, all in all, they're hoping to reduce foodborne illness and reduce cost in the state of Virginia."

Training programs are one of the biggest weapons for fighting foodborne diseases. In 2013, Extension offered 22 food manager food safety certification courses, 33 employee food safety certification courses, and 24 general safe food handling and preparation courses. Extension also provides training for temporary food servers and events, such as when a church hosts a barbecue dinner as a fundraiser.

Extension tailors its training programs to meet the needs of the individual audience while covering the tenets of food safety, which include cleaning and sanitation techniques, separating food to prevent cross-contamination, and keeping foods at the right temperature.

Extension is also expanding its food safety training to new audiences, such as farmers markets, in order to maximize its impact. In the future, Extension would like to hire and train more agents who are dedicated to promoting food safety.



A fairgoer learns about pressure cooker safety from an Extension agent at the State Fair of Virginia.

By the numbers

Extension and Research Funding

(funding sources for FY 2014)

Virginia Cooperative Extension and the Agricultural Experiment Station received

\$174.1 million

from federal, state, and local governments, as well as from grants, contracts, and other sources.



8.5%

Funds from local government



37.2%

State general funds



8.3%

Federal formula funds



46%

Grants and contracts + other funds

Extension and Research Effort (full-time-equivalent employees)

Total number of faculty and staff members for research and Extension **791 FTEs**

Extension **69%**

Virginia Agricultural Experiment Station **31%**

Location of Research and Extension Faculty

District offices **1.5%**

Virginia Tech campus **39.0%**

Agricultural Research and Extension Centers **8.1%**

4-H educational centers **3.3%**

City and county offices **48.1%**

Value of Volunteers

In 2013, Virginia Cooperative Extension had

29,559 volunteers

who assisted Extension staff in delivering educational programs.

They contributed

966,823 hours

of service that is valued at

\$23,677,495*

* Based on a rate of \$24.49 per hour, according to the Independent Sector.

Return on Investment

For every \$1 invested by the state, Agency 229 generates an additional

\$1.69



Youth Programs

More than

185,240

Virginia youth enrolled in 4-H in 2013.

For more information about our programs, visit our websites or one of our local Extension offices.

Virginia Cooperative Extension
www.ext.vt.edu

Virginia Cooperative Extension local offices
www.ext.vt.edu/offices

Virginia Agricultural Experiment Station
www.vaes.vt.edu

College of Agriculture and Life Sciences
www.cals.vt.edu

College of Natural Resources and Environment
www.cnre.vt.edu

Virginia-Maryland College of Veterinary Medicine
www.vetmed.vt.edu

