SUMMER 2015

THE magazine

UNIVERSITY OF KENTUCKY
COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Science!

TEACHING TOMORROW'S THINKERS

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A History of Discovery

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from the dean

Reflections on the Past, Eyes on the Future

During the year when we are celebrating UK's 150-year anniversary, reflections on our past as a land-grant university are frequent. UK was founded as an Agriculture and Mechanical Arts college, and we in the present day College of Agriculture, Food and Environment are proud to be a founding discipline of UK. We live the land-grant philosophy every day, and as UK is more complex today than it was in 1865, so is our college.

One of the most profound aspects of this legacy centers on education, as originally envisioned by the Morrill Act of 1862. At that time, the focus was on men to be educated in "agriculture and the mechanical arts," as well as a liberal arts education. Today, we encourage and celebrate a much more diverse student population, but we have the same philosophy of providing an excellent education for our citizens.

These days, we also offer many more programs; in 1865, 190 students majored in agriculture and were taught by 10 professors in the single department of the same name. From those roots, much knowledge was accumulated, our economy grew, and we developed lots of new technologies. Today, more than 250 faculty offer over 20 undergraduate majors to about 2,500 students, reflecting a great many specializations. Instead of one department of agriculture, now we have fourteen different departments, including not only production agriculture but also forestry, engineering, human sciences, and social sciences.

We also practice, hand-in-hand with teaching, two other distinct areas that weave together as part of our land-grant foundation: research and extension. Research was the second federal program created for our land-grant universities, by the Hatch Act in 1887 for agriculture and by the McIntire-Stennis Act of 1962 for forestry. The Hatch Act created the Agricultural Experiment Station System, under which the college's research programs are coordinated. Soon after the Hatch Act, the Cooperative Extension Service was created by Smith-Lever legislation in 1914.

Today, after achieving so much from forward-looking legislation that is commonly viewed as the best lawmaking ever done by our nation for education, how do we continue to serve our commonwealth? We have the same goal of that first agriculture department, to educate students and improve society. Today, however, we have 2,700 employees and our budget is over $160 million. To do this, we rely on fund sources that include tuition, state, federal, industry, and philanthropic gifts. It takes it all to drive our programs.

Students get real-world experience in a variety of businesses as well as in research and extension programs.

We have extension offices in every county (something few states can boast) and a vibrant set of county agents and field staff, making up the most comprehensive outreach and engagement program at UK. Today's experiment station oversees testing programs for feed, seed, fertilizer, and milk through the Division of Regulatory Services, animal health through UK Veterinary Diagnostic Laboratory, the one-of-a-kind Kentucky Tobacco Research and Development Center, and more than 16,000 acres of research farms and forests in Lexington, Owenton, Princeton, Quicksand/Robinson Forest, and Versailles.

With a track record of 150 years of service on an exciting and productive road, the technologies and knowledge continue to move at a rapid pace, and our newly named college and all its team members are still driven to serve through education and generation of knowledge.

–Nancy Cox
Dean, College of Agriculture, Food and Environment

THE magazine contents

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Volume 16 No. 1

(This page) Postdoctoral scholar Michael Petriello and Professor Bernhard Hennig of the UK Superfund Research Center

(Cover photo) 4-H youth development agent Alex Bryant oversees Breckinridge County Middle School students as they dissect grasshoppers.

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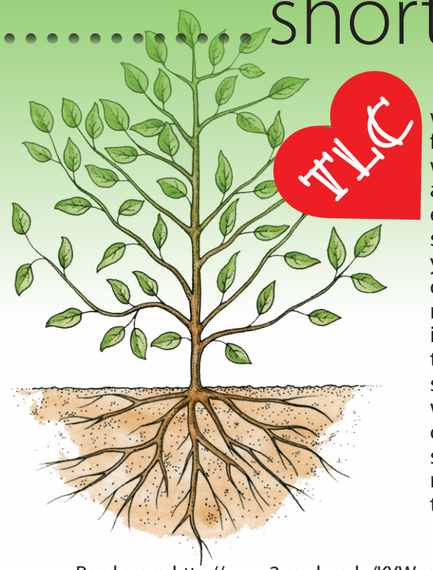
short rows



A little Tree Loving Care, will protect young trees from harsh conditions like wind, extreme cold, heat, and drought and will help ensure their long term survival. During its first few years, a tree expends a lot of energy trying to establish roots deep into the soil. It is particularly susceptible to heat and drought at that stage. About 10 gallons of water a week for the first couple of growing seasons should encourage those roots to go deep and get them off to a good start.

Read more: http://www2.ca.uky.edu/KYWoodlandsmagazine/Vol_6_No_2/FOR101pg4_5.pdf

BULKING UP

In adequate amounts, fiber decreases heart disease risk, controls high blood sugar, improves digestion, and helps with weight management. Yet, most of us consume about 40 percent of the recommended amount. Bulk up for health. Increase your intake of fruits and vegetables with their soluble fiber, which slows the emptying of the stomach, making you feel fuller and keeping blood sugar on an even keel. Whole grains contain insoluble fiber that improves gut health.

Read more: http://www2.ca.uky.edu/agc/pubs/FCS3/FCS3571/FCS3571.pdf

UK Ag EQUINE
Celebrating 10 Years 2005-2015

In 2005, the college launched the UK Equine Initiative—now UK Ag Equine Programs. The distinctive program has accomplished much in teaching, research, and extension. An equine Bachelor of Science degree is now the second largest major in the college. CAFE researchers have led the way in genetics and genomics, infectious diseases and immunology, musculoskeletal science, parasitology, pharmacology/toxicology, reproductive health, nutrition, and pasture management practices—improving the lives of Kentucky's horses, from pets to Thoroughbreds.

Read more: http://news.ca.uky.edu/article/uk-ag-equine-programs-celebrates-10-years

Some Like It Hot

… and dry. Famously, during the Great Depression when the Midwest lay parched under blazing skies, swarms of grasshoppers descended on the region, devouring everything the drought hadn't already killed. However, some grasshoppers, such as the differential, prefer humid conditions and lush, cultivated fields, making it a concern to Kentucky farmers. Differentials are attracted to clover and alfalfa fields in particular, where they deposit eggs along the field margins. The hoppers have also been known to have a taste for orchards, our native poplar and catalpa trees, and even grape vines.

Read more: http://www2.ca.uky.edu/entomology/entfacts/ef116.asp

Sweet Summer on a Vine

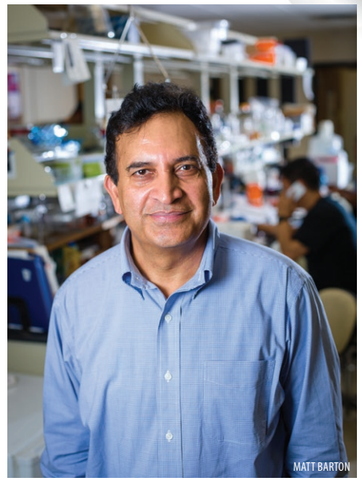
Kentucky overflows in the summer with the sweet taste of watermelon. The crop is the second-largest fresh market vegetable grown in the state—we'll debate vegetable vs. fruit some other time. Going with the flow of popular demand, most of the watermelons grown in the state are of the seedless variety. And because variety is the spice of life, consumers are also interested in smaller melons and those with interesting flesh colors or rind patterns.

Read more: http://www.uky.edu/Ag/CCD/introsheets/watermelon.pdf

spotlight

Reddy Palli

Entomologist Reddy Palli has focused his career on developing environmentally sound pest management methods. In the process, he has developed technologies that have human health implications, including a gene switch that is in phase 3 clinical trials to fight cancer. In July, he assumes the role of chair of the Department of Entomology.


MATT BARTON

Q: How did you develop your interest in agriculture?

A: I grew up on a farm in India. My father grew rice, sugarcane, and cotton. Those require highly intensive pest control operations. People actually got sick, because they didn't take the proper precautions with insecticide application. Watching that, I developed an interest in entomology. My goal has been to develop safer pest management methods.

Q: Tell me about your career path to UK.

A: After post-doctoral training at the University of Washington, I established a molecular entomology lab at the Great Lakes Forestry Centre in Sault Ste. Marie, Ontario, to control spruce budworm. I collaborated with Rohm and Haas Company, which was developing insecticides that mimicked insect hormones. They are much safer than regular neurotoxins, because these hormones are only present in insects. I went to that company's Philadelphia research and development labs, where I got into gene switches. We used a combination of a receptor I brought from Sault Ste. Marie and chemicals discovered by Rohm and Haas to regulate expression of genes to kill cancer cells. After Rohm and Haas sold my division, I started looking for university work and came to UK in 2002.

Q: What is your latest work?

A: My lab is working with a new technology called RNA interference. We developed a technology where we can spray an RNA trigger to control the Colorado potato beetle. We published these methods first, though another company was working on the same project, and they applied for the patent a few weeks before us. It works well in beetles, but it doesn't work in other insects like sucking insects or moths. We are trying to understand why. If we are able to cross that barrier, there will be more applications to follow.

Q: What achievements are you the most proud of?

A: For a scientist, it's very pleasing to see your work regularly used. So the gene switch is one example. When I heard about the RNAi spray being commercialized, I was happy—even though I won't be rich—because I was involved in developing that technology. ◆


JEFF FRANKLIN

That Thursday Thing

When Marie Halpin retired from her job as a social worker in 1999, she knew she wanted to do something to keep busy. She bought a farm in Nicholas County for "fishing, frogging, and hunting." Then she started attending Third Thursday Thing at Kentucky State University's Research and Demonstration Farm.

A monthly sustainable agriculture workshop that targets small farmers, beginning farmers, and agricultural professionals, the Kentucky Cooperative Extension program helped Halpin find her niche. She thought she wanted cattle but didn't feel comfortable handling an animal that large. Dairy goats seemed to be the right fit.

"I bought one goat, and thought if I could live with one, I could live with more," Halpin said. "So I bought three more."

Now she keeps 25 to 30 goats, and during kidding season, that number rises to around 60. She says raising goats is a learning experience, and she is still learning, but she gives a lot of credit to Third Thursday Thing.

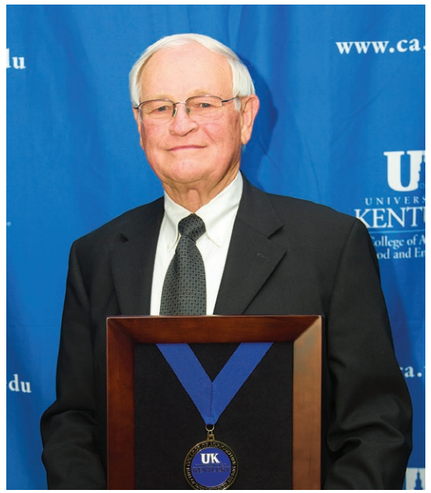
"Third Thursday has helped me improve my hay quality, taught me about fencing, and helped me get grants for fencing," Halpin said. "There are a lot of things you don't think about, if you are not farm-raised. They help you succeed."

Halpin likes showing her nanny goats at county fairs, the Kentucky State Fair, and the North American International Livestock Expo in Louisville. By being visible, she is able to sell them.

"I like to travel, and if I travel, I go with my girls." ◆

—Jeff Franklin

Hall of Distinguished Alumni



The College of Agriculture, Food and Environment inducted 10 alumni into its Hall of Distinguished Alumni, the highest honor the college confers.

Randall Barnett, '57, MS '64

4-H introduced Randall Barnett to the college 71 years ago, while he was growing up on a Washington County farm. It was the first in what he called a series of dots representing significant points in his life.

"These dots reflect, collectively, a very happy rewarding career; I owe so much to this college," he said.

Barnett began his career as an assistant 4-H agent and rose through the ranks to associate dean in the college.

His most lasting legacies include the agricultural leaders who honed their skills through the Philip Morris Agricultural Leadership Program, which he founded and directed for many years. The program is now known as the Kentucky Agricultural Leadership Program.

As assistant director for field operations with UK Cooperative Extension, he garnered support for establishing and expanding extension tax districts. Today, county extension offices use the local tax to enhance facilities and programs.

He was also instrumental in creating the extension advisory council system and was among the leaders who set up the first National Extension Advisory Committee.

While associate dean, he led farm organizations, commodity groups, agricultural businesses, and educators to focus on diversifying and expanding the state's agricultural economy. That effort was a precursor to the Kentucky Agricultural Development Fund.

Thomas Hammond, '67

Tom Hammond said he couldn't have dreamt where his life would lead, walking to class at UK nearly 50 years ago.

"That I would be a broadcaster, and it would take me around the world to describe some of the greatest sporting events on the planet; I always felt my UK education prepared me for anything," he said.

Hammond grew up around the college, where his grandfather, Thomas Poe Cooper, was dean. He followed in Cooper's agricultural footsteps, receiving a degree in animal science with an emphasis in equine genetics.

Today he is recognized as a national expert on Thoroughbred pedigrees as well as one of the leading network sports broadcasters. Hammond's body of work includes coverage of the Olympic Games for NBC, thoroughbred horse racing, college and professional basketball, gymnastics, and figure skating.

He has twice earned horse racing's top honor, the Eclipse Award, and received Emmys for his coverage of the 1992 Breeders' Cup; basketball, 1988; track and field and diving, 1992; and Olympic track and field, 1996.

Hammond is in the Kentucky Journalism Hall of Fame and the UK Hall of Distinguished Alumni. The Bluegrass Sports Commission annually gives the Tom Hammond Lifetime Achievement Award in Sports Broadcasting.

College of Agriculture, Food and Environment

2015 Inductees

Photos by Matt Barton

William G. Moody, '56, MS '57

"I have to give credit to my late parents, who taught me the love of nature and animal agriculture," William G. Moody said. "I majored in animal husbandry at UK, and I knew I had found my life's calling."

As a meat scientist at UK, he taught more than 2,500 students and shepherded 55 graduate students. He also had an active meats research program that improved the quality of restructured beef and country hams, and he concentrated on adding tenderness, palatability, and value to grass-fed beef.

For 30 of his 37 years at UK, Moody served as an adviser to several student organizations. He is credited with initiating and coordinating the annual Southeastern Meat Judging Contest.

The seven teaching awards he received reflect his passion for students and his excellence in teaching and service. They include being named a fellow of the American Society of Animal Science, American Meat Science Association Distinguished Teacher Award, and UK Alumni Association's Great Teacher Award. From the proceeds of the UK Chancellor's Award for Outstanding Teaching for Tenured Faculty, he created a scholarship for students majoring in meat/food science.

Moody is a member of the UK Department of Animal and Food Sciences Hall of Fame.

John Robertson, '53, MS '58, PhD '60

"This is such a great honor," said John Robertson. "I remember so many other people who gave so much, and I hope you permit me to include them in this honor."

As UKAg associate dean for instruction from 1968 to 1994, Robertson started a career placement service as well as international exchange programs in China and France that continue today.

Robertson also saw the need to strengthen the college's relationship with alumni, which resulted in the creation of the Ag Alumni Association in the early 1970s. Robertson contributed to the development of what is today the National Agriculture Alumni and Development Association.

During his tenure, the college scholarship program was expanded, and in 1991 he initiated the annual scholarship banquet that recognizes students and donors and lets them interact with each other. In 1994, he established his own scholarship fund for undergraduate education.

Robertson received the first doctorate in animal husbandry at UK.

His initial position with the college was as the Purchase Area swine specialist, where he developed new extension programs that brought together emerging technologies, better resource utilization, and sound business practices resulting in a more profitable industry as well as an effective organization, the Kentucky Pork Producers. ◆

This year's posthumous award recipients are Henry C. Besuden, William G. Finn, William C. Johnstone, Joseph H. Kastle, William D. Salmon, and Jesse W. Tapp.
Find more information about these honorees at http://alumni.ca.uky.edu/HallofDistinguishedAlumni.

Operation Chicken Hatch

A chick has to peck at the inside of its shell thousands of times before it breaks through. For one set of chicks, hatch day finally arrived, and more than 100 residents of a Carroll County assisted living facility watched intently, as the exhausted, fluffy chicks emerged from their shells in the culmination of Operation Chicken Hatch. The residents, some seeing their first chick hatch, greeted the peeps with cheers and applause.

Carroll County Cooperative Extension highlighted the progress throughout the incubation period with daily updates to their Facebook page. The updates included facts about what development should be occurring on each particular day.

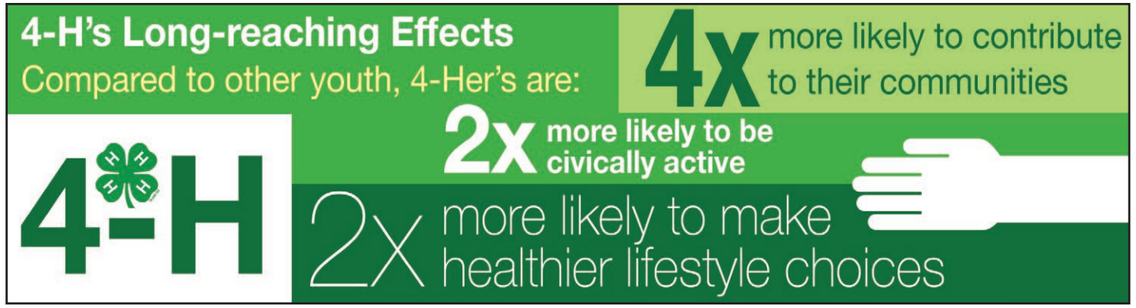
"It was a unique project that helped us further our mission to promote agriculture in the community," said Christin Herbst, agricultural and natural resources extension agent for Carroll County. "We hosted a farm field day at the facility for the residents and the community to come learn more about agriculture and our extension programs."

The field day at Fairview Place Senior Living Community coincided with day 21 of the incubation period—the regular hatch time for chicks—and included other livestock species and exhibits.

PHOTO PROVIDED BY CHRISTIN HERBST

By the end of the day, 19 chicks successfully hatched. Carroll County 4-H'ers adopted them to begin a 4-H poultry program. Six 4-H'ers later showed their full-grown chickens at the Carroll County Fair. The project was such a success that Herbst is now planning Operation Duck Hatch.

—Aimee Nielson



Rising from the Rubble

March 2, 2012 was a dark day in Eastern Kentucky. Powerful, EF3-strength tornados cut a destructive path across the area, leaving demolition and death in their wake. West Liberty, the county seat of Morgan County, was one of the hardest hit communities, its downtown business district virtually blown away. The county Cooperative Extension office, located on Main Street, was reduced to rubble.

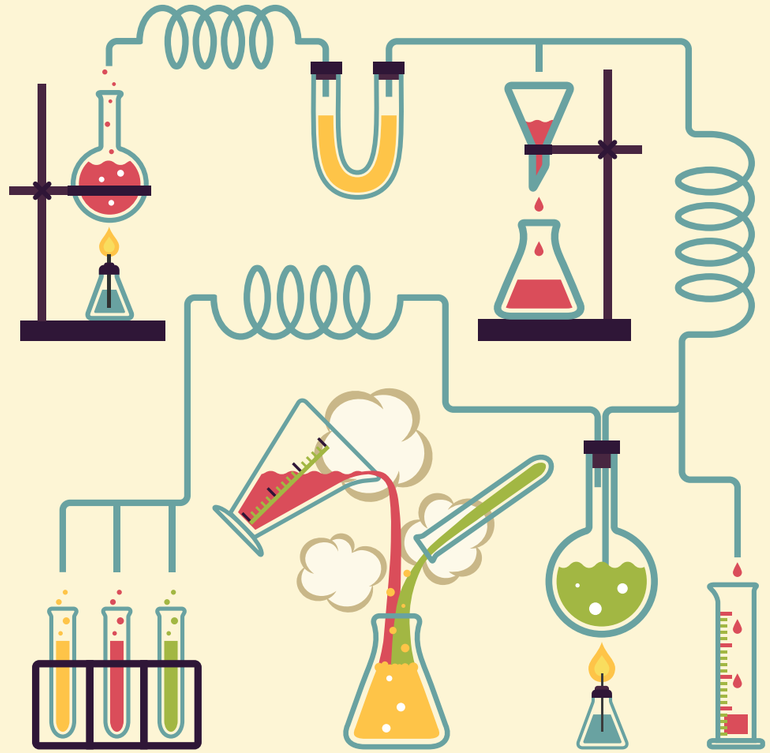
On a bright day in May, three years later, a ribbon-cutting ceremony officially opened the new office. The 9,000-square-foot building has meeting space, a certified commercial kitchen, and safe rooms for shelter in case of severe weather. The office building now sits on 150 acres east of West Liberty on U.S. 460, land which includes an educational farm where UKAg personnel can collaborate on applied research projects at the county level.

—Jeff Franklin

UNIVERSITY OF KENTUCKY 150 YEARS 1865 - 2015

A History of DISCOVERY

By Katie Pratt



The Kentucky Agricultural Experiment Station is more than the sign on Scovell Hall, the University of Kentucky building bearing the name of its first director. You will find it in laboratories on campus and at UK farms located at Princeton, Quicksand, Lexington, and Versailles. More than facilities, however, the station is College of Agriculture, Food and Environment researchers who seek answers to pressing issues that impact the state, the country, and the world.

"At the experiment station, our researchers test technologies and practices that may or may not work out. We take the risk. We invest our time, equipment, and resources, so we can advise farmers on the things that work best," said Nancy Cox, college dean and former experiment station director. "This keeps them from having to take that risk themselves."

Kentucky has long been a leader in experiment station work. The first director, Melville Amasa Scovell, arrived in Lexington on Thanksgiving Day 1885. Before Christmas, he published the first experiment station bulletin detailing Professor A. E. Menke's research on tobacco fertilizers. This was nearly a year and a half before Congress passed the Hatch Act, creating an experiment station in every state.

Equine Aid

Over the past 130 years, the Kentucky Agricultural Experiment Station has made many important advancements. It may seem fitting that the first research to bring national and international acclaim to the experiment station involved one of the state's signature industries. Beginning in 1907, UK scientist E.S. Good studied infectious abortion in cattle and horses. Good identified the bacteria responsible for foal losses as part of the *Salmonella* group. Within four years, he developed a successful vaccine for mares and studs.

Nearly 100 years later, UK animal scientists and entomologists joined forces to determine the cause of Mare Reproductive Loss Syndrome. The syndrome hit the horse industry hard in 2001 causing late-term foal losses, fetal losses, and weak foals. UK researchers found the cause of the disease to be eastern tent caterpillars, which were inadvertently consumed by horses.

Scott Smith was the college dean and experiment station director when MRLS hit.

"It was more than a research problem. It required unraveling a mystery on an emergency response schedule," he said. "The answers arose from a multidisciplinary investigation of pastures, insects, and horses. That team could have been assembled, and assembled that quickly, at very few places in the world."

Trying Times

The Great Depression and two world wars brought trying times to Kentuckians and Americans. The experiment station helped ease some of the burdens people carried. During the Great Depression, UK was one of the first experiment stations to partner with the Works Progress Administration to conduct detailed studies on aspects of rural social relief. UK also partnered with the Tennessee Valley Authority to test TVA-manufactured phosphate fertilizer and compare it with similar ones used in the seven Kentucky counties that are part of the Tennessee Valley.

(Above) Experiment station researchers solved the deadly mystery of Mare Reproductive Loss Syndrome. The cause? The eastern tent caterpillar, inadvertently consumed by mares.

In 1939, the college's Animal Pathology Department became the National Salmonella Center, charged with identifying cultures from across the United States. As the war in Europe escalated, the International Salmonella Center in Copenhagen, Denmark, was no longer able to receive cultures, so those also came to Kentucky for identification.

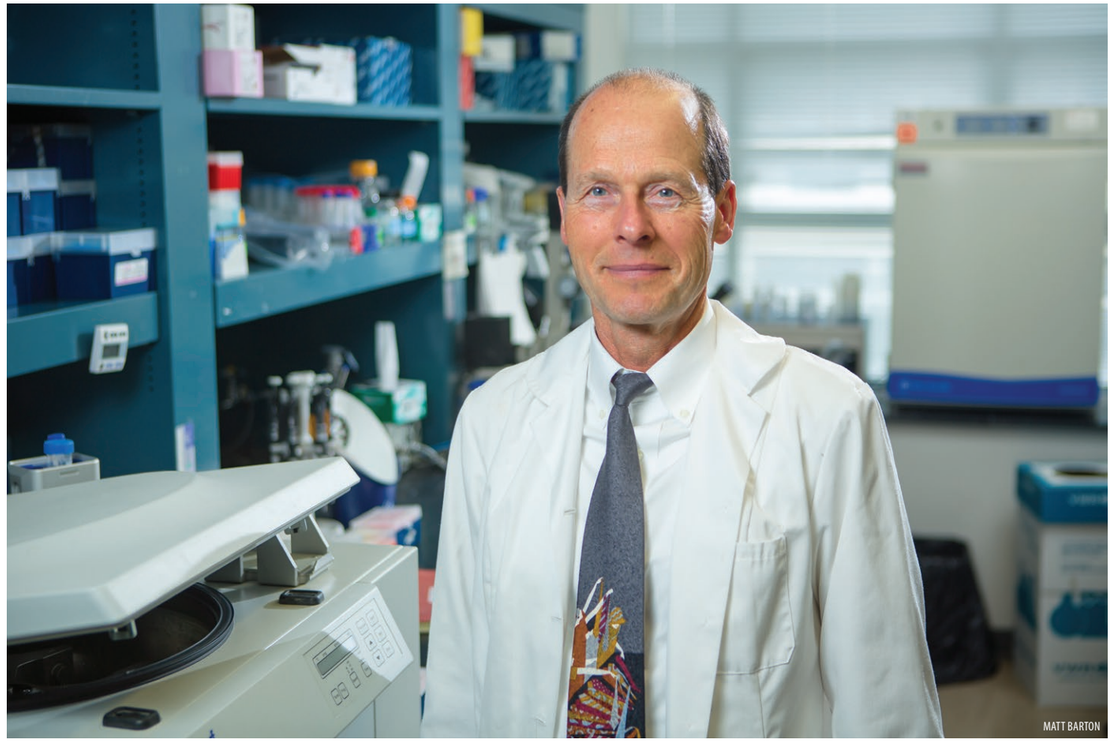
This important work did not go unnoticed by the U.S. military. In 1942, researchers partnered with the Army Medical Corps to prepare a serum used to diagnose diarrheal disease and to detect carriers among troops and civilians in all theaters of the war. UKAg researchers also trained a large number of military personnel and civilians on salmonella identification.

Realized Potential

In the early 1960s, college researchers joined extension specialists and a group of Western Kentucky farmers to study crops planted in unplowed ground. This innovative research and education in conservation and no-tillage resulted in widespread use, increasing grain acreage, improving soil productivity, and saving on equipment maintenance and energy.

"I saw Kentucky agriculture begin to realize its tremendous potential," said former dean Oran Little, who was associate director of the experiment station from 1969-1985 and director from 1988-2000.

(Below) Research and education on no-tillage resulted in improved soil productivity.



Can diet protect against PCB-caused heart disease? Bernhard Hennig is determined to find the answer.

When faced with adversity, such as the end of the federal tobacco program in the 1990s, college researchers continued to focus on farmers' potential and priorities, while working closely with farm leadership and legislators.

The impact of new and innovative farming methods is reflected in the state's annual farm receipts, which had grown to more than $6 billion by 2014.

Today's Researchers

For current UKAg researchers Bernhard Hennig and Lisa Vaillancourt, research is more than just a job, it's a passion. When asked about their current research projects, their eyes light up and smiles spread across their faces.

Hennig has always been interested in how nutrition can improve health and reduce disease occurrences. As the director of the university's Superfund Research Center, he gets to explore this every day. The center, housed within the experiment station and funded by a $12.2 million grant from the National Institutes of Health, supports the work of more than 50 researchers and students from 15 departments in five different colleges within the university. Research projects range from biomedical topics to ways to clean up Superfund sites, which are defined by the U.S. Environmental Protection Agency as uncontrolled or abandoned places containing hazardous wastes.

"The ultimate outcome of this grant is to improve human health," Hennig said.

He is the primary investigator on a project that studies whether a healthy diet can protect against vascular inflammatory diseases, such as atherosclerosis or heart disease, brought on by the toxic chemical PCB, which is often found near Superfund sites.

Vaillancourt, a UK plant pathology researcher, was a pre-med student in college when she took a required botany class. She was hooked when she found out that plants get sick too and she could find ways to help them.

"I can't imagine a better job, where I can be

creative, solve puzzles, hang out with really smart people from all over the world, and get a chance to help people, which was my original reason for pursuing medical school," she said.

Vaillancourt's lab studies fungi belonging to the *Colletotrichum* (anthracnose) family and their effect on grasses, specifically sweet and grain sorghum and corn. She is a co-primary investigator of a $1 million U.S. Department of Agriculture-Department of Energy grant awarded to several international researchers to study the sorghum fungus to improve the plant's bioenergy potential, as well as the primary investigator on a $1 million USDA grant for research on the corn fungus.

"In the U.S., seed companies estimate about 5 percent of our potential corn yield is destroyed every year by the presence of that fungus," she said. "According to the National Agricultural Statistics Service, 5 percent would have been worth about $3 billion to U.S. corn growers and about $5.5 million to Kentucky producers in 2013."

Lisa Vaillancourt studies fungi and their effect on sorghum and corn.

A related fungus is the No. 1 disease of sorghum, a major food source worldwide. The fungi are host specific, meaning that the corn fungus can't attack sorghum and vice versa.

"We are really interested in why that is, and what's different in their genomes," she said. "If we can figure that out, we have an idea that we could identify their targets in the plants and then swap them to create disease immunity in both plants."

While they are in the same college, Hennig's and Vaillancourt's research couldn't be more different, providing a perfect example of the vast diversity in research interests within the experiment station. This immense research diversity has led to a major increase in competitive grant funding for the college, from $6 million in 2001 to more than $30 million today.

Newly named experiment station director Rick Bennett said past successes of the experiment station are one of the reasons he was attracted to the job. Moving forward, he sees the experiment station continuing to be a valuable asset to Kentuckians, and so much more than just a sign, a name, or a place.

"We will continue to serve the people of Kentucky and agricultural producers and make sure the research we're doing benefits Kentuckians in ways that enhance welfare and agriculture in the state, while helping producers gain a competitive edge in national and international markets." ◆

Passionate About Research

After a lifetime spent as a scientist and directing research programs, Rick Bennett is still passionate about research. The new director of the college's Kentucky Agricultural Experiment Station and associate dean for research assumed his duties June 1, enthusiastic about overseeing an enterprise that provides vital answers to problems Kentuckians face.

His childhood on a diversified dairy farm in western Maryland ensured his ag roots would grow deep.

"My interest in research came early, because I always questioned how and why crops and animals produced what they do," he said. "Life is always interesting and fascinating on a small farm."

Most recently, as head of the University of Arkansas Department of Plant Pathology, Bennett directed national and state research and extension programs and built partnerships with state and federal agencies. Prior to that, he spent 17 years in various roles with the U.S. Department of Agriculture's Agricultural Research Service. As national program leader for plant health, he managed a national research program with an annual budget of more than $68 million.

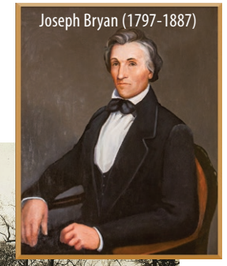
Besides promoting success of the college's research branch, he will also supervise several critical support programs, including Regulatory Services, Veterinary Diagnostic Laboratory, Kentucky Tobacco Research and Development Center, and research substations at Princeton and Quicksand.

Bennett's plans include working toward sustained growth of the experiment station's broad stakeholder support.

"We welcome Dr. Bennett and his family to Kentucky," Dean Nancy Cox said. "We are fortunate he is joining our leadership team and look forward to growing CAFE's diverse research programs that are critical to Kentucky's economy, environment, and quality of life." ◆

South Farm: An Ancient History

If ever there was an urban farm, it is the college's Horticulture Research Farm, six miles from downtown Lexington. Now an oasis in the midst of residential and commercial development, South Farm, as it is affectionately known, has an agricultural history that dates back thousands of years.


Joseph Bryan (1797-1887)


Painting by Greg Harlin ©McClung Museum of Natural History and Culture, University of Tennessee Knoxville.

Native Americans farmed the land 1,000 years ago, growing squash, corn, tobacco, and sunflowers until their populations were decimated by the introduction of diseases from European settlers in the mid-1600s.


Hemp after harvest in central Kentucky, early 1900s.

Daniel Boone surveyed the original 2,000 acres for his nephew, Daniel Boone Bryan, who not only farmed the land, but also operated a gristmill, a paper mill, and a distillery on the site, among other entrepreneurial endeavors. Generations of Bryans used innovative methods to raise hemp, fruits, vegetables, corn, wheat, tobacco, grapes, cattle, pigs, and Thoroughbreds and trotters.


UK Professor of Horticulture
Dr. Emery M. Emmert (1900-1962)

Today's high tunnel research at the farm, led by Assistant Professor Krista Jacobsen, is based in part on the pioneering work in the 1950s of UK's Professor Emery Myers Emmert. Considered the inventor of plastic greenhouses, high tunnels, row covers, and plastic mulches, his work significantly reduced weed pressure, conserved water, and impacted global agriculture.

Thousands of research trials in fruits, vegetables, flowers, and nursery and greenhouse crops have occurred on this site since 1956, when the state bought 200 acres for the college to use as a research farm.

In the 1990s, much of the farm was sold, resulting in the development of commercial properties immediately across Man O'War Blvd. The remaining 80 acres house a certified organic research farm, a vineyard, and fruit orchards.

Since 2007, the student-operated Community Supported Agriculture (CSA) program has provided shareholders with weekly deliveries of fresh organic produce. In 2014, the CSA produced more than 65,000 pounds of fresh produce and provided training for 15 interns. ◆

MATT BARTON

Maine Chance Farm

Home to the college's equine campus, horses called this property home long before UK bought it in 1967 from cosmetics magnate Elizabeth Arden.

MATT BARTON

Someone who has skipped a meal or two might experience stomach discomfort. Skipping several meals, however, or eating nutritionally incomplete meals for long stretches leads to a more desperate physical and psychological pain. That's real hunger.

To survive, many turn to friends and family, visit local food pantries, apply for government assistance, and use what little money they have to buy cheap, processed food that doesn't meet their nutritional needs. As a result, they're fatigued, they gain weight. They don't necessarily "look" hungry, but their body is starving for healthful, fresh, nutrient-dense food.

"There are people are out there working very hard, and they still can't make ends meet," said Ann Vail, director of the School of Human Environmental Sciences. "Our family and consumer sciences specialists and agents are on the front lines trying to teach those with limited resources how to meet their nutritional needs."

More than 611,000 Kentuckians, or one of every seven, received assistance last year through the state's food bank network according to the Hunger in America 2014 report. Of those, the household median annual income was $9,150 and only 35 percent were employed. Even more startling, only 15 percent of food bank clients were "food secure," meaning they had adequate amounts of safe and nutritious food at all times. More than 69 percent have to choose between food and medical care, and more than 90 percent make food purchase decisions based on price over health.

"The recession led to rising numbers of people who, for the first time, had to apply for state and federal assistance," Vail said. "At the height of the recession, nutrition assistance recipients doubled in some counties."

A New Way to Fight Hunger

Recently, the U.S. Department of Agriculture announced a partnership with the college to establish the National Rural Child Poverty Nutrition Center.

The center will use cutting-edge solutions in child nutrition to reduce food insecurity in states with the highest number of persistently poor rural counties. Children are the most vulnerable group in rural counties.

"Part of our core mission as a land-grant institution is to improve the lives of our citizens," said Dean Nancy Cox. "We are honored the USDA has chosen us to be their partner in this extremely important endeavor to reduce child food insecurity in persistently poor rural counties in Kentucky and several other states."

Once programs begin, the Rural Child Poverty Nutrition Center will work to coordinate existing child nutrition programs and create solutions to target child food insecurity.

Traditional Programs Still Work

Extension specialists and agents are pivotal in administering the Kentucky Nutrition Education Program, which targets those with limited resources and encompasses two USDA programs: Supplemental Nutrition Assistance Program Education (SNAP-Ed) and the Expanded Food and Nutrition Program (EFNEP). More than 810,000 Kentuckians, representing over 18 percent of the state's total population, receive SNAP benefits. These numbers place Kentucky in the top ten SNAP states.

"The goals of these programs are to teach our clientele how to plan nutritious meals on a limited budget, safely handle food, and improve their food preparation skills, as well as encourage behavior that is essential to a healthy lifestyle," said Debra Cotterill, NEP director.

To drive home those messages, county agents and assistants facilitate cooking classes and champion Farm to School partnerships. They cultivate community gardens and teach clients how to create and stick to budgets.

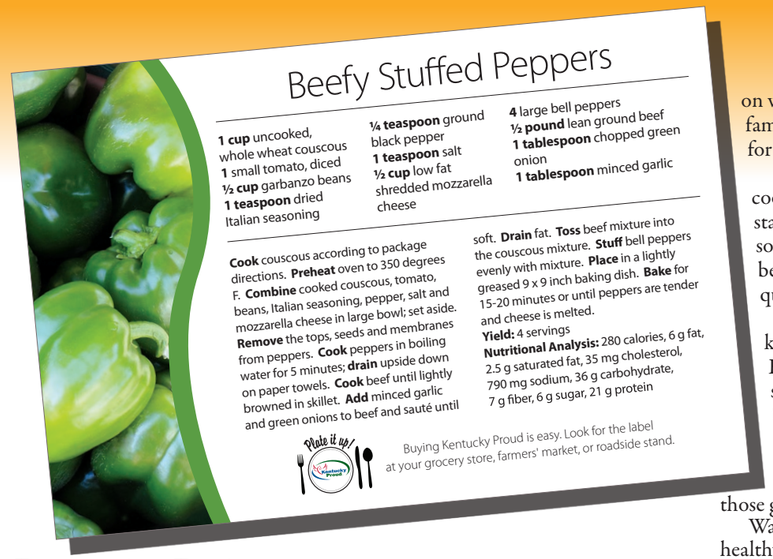
Raising two daughters on her own, Ali Sanders knows the realities of a tight budget. Last fall she was accepted into a housing project in Bourbon County through Community Action. As part of that program, Sanders is required to attend monthly life skills classes. When she realized the local Cooperative Extension office was offering nutrition classes at the same location, she decided to try it.

"We have been able to learn about so many things," she said. "We've learned to make healthy substitutions for things we already eat—whole wheat pasta instead of the enriched flour varieties. We tried eggplant. I would have never tried eggplant, and now I buy it all the time; my girls love it too."

Sanders said the classes, led by Kacy Wiley, the UK SNAP-Ed assistant in Bourbon County, have affected the way she thinks when she shops and cooks, and they have helped her create real change at home.

"A lot of us [in the classes] have grown up in the mountains or the country, and we've always been the meat and potatoes kind," she said. "Kacy has challenged us to think outside that box. I realized I cook the way I was taught, and that's probably what my girls will do. That's a big deal to me. I want to teach them to lead healthy lives as children, so they will be healthy adults. I want us to be the change."

Nutrition classes led by Kacy Wiley (l) have changed the way Ali Sanders (r) shops and cooks.



Revamping Recipes

The college's Department of Dietetics and Human Nutrition is partnering with the Kentucky Department of Agriculture in Plate It Up, a program to provide healthy, great-tasting recipes using Kentucky Proud products. Assistant professor and director of undergraduate studies, Tammy Stephenson, said students take an experimental foods class and focus on tweaking traditional meals to make them more nutritious.

The students revamp the recipes, test them in class, and then conduct taste panels to determine which recipes end up on Plate It Up recipe cards. Extension agents use the cards to help their clients learn to plan healthier meals. The Nutrition Education Program has identified several simple recipes using a limited number of ingredients that are especially helpful to limited-resource individuals.

Healthy Behaviors Make Healthy Communities

An ongoing social marketing research project is yielding some interesting results about the way people feed themselves and their families.

"We thought we really wanted to encourage more family meals at home," said Jackie Walters, extension specialist for nutrition. "We do want to do that, but this study has shown us that we need to put more emphasis on what they are cooking at home. We want families to be cooking things that are good for their health."

Walters said the biggest barriers to cooking at home are cost, time, and health status. Limited resource individuals sometimes rely heavily on processed food, because it lasts longer, but nutritional quality suffers.

"The study reinforced what we already knew," Walters said. "Most of our SNAP-Ed clients aren't able to make those dollars stretch, and they run out of nutritious food before the end of the month. We can teach them to make good decisions, but if their environment is not supportive, it's impossible for them to keep making those good decisions."

Walters said that even if clients want to make healthy choices, sometimes they don't have a car and live too far from a store that has the right kinds of foods.

To that end, many agents are getting involved in the policy and decision-making councils, coalitions, and programs in their areas as a result of a national Policy, Systems and Environmental Change Interventions initiative.

"Everything we do in the NEP is in an effort to improve health outcomes. That, in turn, will impact the economic health of our state," Cotterill explained. "Healthier kids have better test scores, and that means more kids going to college and ultimately having more profitable careers. It all comes together for a better Kentucky."


MATT BARTON

After revamping old recipes to make them more nutritious, Dietetics and Human Nutrition students hold taste testings in the cooking lab in Erickson Hall.

Students Tackle Hunger

When Denise Schaeffer came to UK to study in Dietetics and Human Nutrition, her work with the Student Dietetics and Nutrition Association made her aware of the prevalence of hunger in Kentucky and beyond.

Schaeffer, a junior, is the association's co-chair for hunger. She's attended the Universities Fighting World Hunger Summit in Guelph, Canada, and the Food, Waste, and Hunger Summit hosted by the national Campus Kitchens Project to find ways to improve UK's newly launched Campus Kitchen. The student service organization, supported by Dietetics and Human Nutrition faculty, was created to battle hunger in the Lexington area.

The UK group is an affiliate of the national The Campus Kitchens Project, which provides a sustainable approach to reducing food waste on college campuses while providing healthy meals to those struggling with hunger. They recover unused, quality food from UK Dining, as well as from local restaurants, the UK Horticultural Research Farm, farms, and farmers' markets. Trained volunteers cook and store the donations according to established food handling regulations.


PHOTO PROVIDED BY DENISE SCHAEFFER

Denise Schaeffer

Schaeffer said her goal is to be involved with Campus Kitchen by helping collect food from dining halls this fall and to continue working through the Student Dietetics and Nutrition Association to raise money and food and ultimately make UK students more aware of hunger.

"The students' energy has really propelled this project through a phenomenal first year," said Sandra Bastin, chair of the Department of Dietetics and Human Nutrition. "We've had 20 students step up and take charge of the efforts. Each one of them brings something unique to the project, but they all share a common desire to help others."

"When we opened our Campus Kitchen, I got interested in collecting unused food in our dining halls to give to the elderly in our community who don't have access to food," Schaeffer said. "The moment I heard the statistics about children, elderly, and many others who have limited access to healthy food, it really sparked my interest to fight hunger."

During the first six months of operation, students spent 1,439 hours recovering 1,878 pounds of food and serving 2,069 meals; including 230 meals to older adults and 360 meals to children and youth.

"Student volunteers use their critical-thinking and problem-solving skills to develop partnerships, glean, plan menus, run cooking shifts, organize fundraisers, and teach nutrition," said Amanda Hege, director of community outreach for the Department of Dietetics and Human Nutrition. "Campus Kitchen is cultivating leaders to develop solutions to end hunger."

Student volunteers deliver meals, education, and hope to the Martin Luther King Jr. Academy for Excellence, Arbor Youth Services Homeless Shelter, Lexington Housing Authority, and Central Christian Church apartments, and meals and groceries to the homes of older adults in Lexington. One meal recipient shared, "I am now able to eat more fresh fruits and vegetables. This program changed my life."

Organizers are planning to integrate with other hunger-fighting organizations on campus like the Big Blue Pantry, a student-run, student-serving food pantry.

"All these programs and initiatives show our commitment to addressing hunger and food security locally and throughout Kentucky," Vail said. "The enthusiasm of our faculty, staff, and students is infectious, and it reassures me that we can make a difference in the lives of the people we serve." ◆


MATT BARTON

When Michael Goodin walked into Stonewall Elementary School on an evening in April, he carried in his bag of freshly carved carrots, peppers, and cucumbers a little bit of art, a whole lot of imagination, and

By Carol Spence
Photography by Matt Barton

The foundation of everything around us, science is in the food we eat, the cars we drive, our fuels, infrastructure, communications, health. Today, as the world grows smaller and the problems larger, we will turn more than ever to scientists for answers—scientists who are, at this very moment, in elementary, middle, and high schools. Even those students who will grow up to pursue careers in the arts, business, healthcare or education may unconsciously frame their ideas based on concepts they learned in their early science classes.

Science education teaches children to draw conclusions based on observation and information collected. It also teaches them to think logically, and formulate ideas and answers based on facts, not on rumors or emotions.

Goodin, UKAg professor in Plant Pathology, and his undergraduate students enjoy visiting elementary school science fairs, where they invite the youngsters to build people out of vegetables. With bell pepper torsos, cucumber heads, and radish feet, the veggie people provide the link between plants and animals and open a discussion about basic health and biology. Goodin said the children eat this stuff up, literally, which supports a discussion of how to convert plant cells into animal cells.

"Kids are completely dialed in. There's no restriction (on how to build their veggie people). All it takes is imagination," he said. "They are going to be the leaders and the doers and the active participants in society; they need to know how to debate and free think and consider alternate opinions. You have to have an imagination."

To Goodin and other college and extension personnel who fervently believe in the value of a science education, studying science provides young people with that and more.

"Increasingly, I get freshmen (in my classes) who marvel when I talk about the importance of imagination in the career of a scientist. How do you compile and organize the data? How do you develop the hypothesis based on what the data is telling you? What model are you going to build, and then what experiment are you going to design to test that model? Innovation requires imagination," Goodin said. "You need to stimulate those skills very early on."

Across campus in the Cooper Building, forestry professor Mary Arthur doesn't approve of the boxes in which society prefers to enclose concepts. To Arthur, science doesn't belong in one box and art in another.

"That's actually not how the world works," she said. "It's really exciting when somebody who is very artistic applies that art to things that have a scientific basis. I think there are a lot of different ways that you can bring scientific understanding to all sorts of things that you do, and that enhances our ability to work across all different kinds of boundaries."

Science Literacy

As a society, Americans generally hold a positive view of science. A recent Pew Research Center poll revealed that 79 percent of adults believe science has improved life for most, yet the majority of both scientists and the general public believe that STEM (science, technology, engineering, and mathematics) education in the United States falls behind that of other countries. Among scientists themselves, 75 percent responded that not enough STEM education in grades K-12 is "a major factor in the public's limited knowledge about science."

According to a 2001 National Science Foundation Survey about science literacy (their most recent), two-thirds of Americans polled did not clearly understand the scientific process, a method that includes observation, forming a hypothesis, and testing that hypothesis by collecting data and replicating trials. To understand this method is to be science literate, which contributes to a well-informed citizenry capable of critical thought.

Blake Newton is a UK 4-H extension entomology specialist. Introducing young people to the natural world is what he does, through camps and workshops and with the help of extension agents who take science education into the schools. He knows that not every child he works with will grow up to be a scientist. But no matter what that child ends up doing, Newton believes the lessons he and the agents teach are important ones.

"One of our goals is to show kids how science experiments work," he said. "The scientific process works the same whether you're working with weather or whether you're working with insects, so whenever they read about a new science experiment, about the climate, or about food or new technology, they can at least understand a little bit about how the process works. Someone who doesn't understand the process at all could think, 'Are they just making this up? Are they just going outside and putting their thumb in the air? How do they get this information?'"

A student in Alex Bryant's science lab in Breckinridge County Middle School examines the structure of a grasshopper.

Campbell Junior High School 7th graders participate in Physics Zoo presented by Clark County 4-H youth development extension agents Heather Cassill and Rachel Noble.

From a Cockroach, Lessons Learned

Alex Bryant has a master's degree in entomology. As the 4-H youth development extension agent in Breckinridge County, she has been working on a program, the Mystery of the Madagascar Hissing Cockroach, with the county's middle-school science teachers for the past two years. UK Cooperative Extension provides a colony of hissers, as they're sometimes called, and throughout the school year, the students are responsible for caring for them. Once a month, Bryant conducts labs that she and the teachers have designed. One month, the students race their cockroaches through homemade pool noodle racetracks and determine their velocity. Another month they talk about sound and calculate the frequency of the cockroaches' hiss. They study nutrient cycling by role-playing a nitrogen molecule traveling through the gut of a cockroach.

Inexpensive and engaging, insects illustrate a broad range of scientific principles that match the Next Generation Science standards Kentucky schools follow. In the 7th grade, the focus is on physical- and chemistry-related sciences. In 8th grade, the lessons focus more on biology. The plan for next year is to expand these lessons into the 6th grade.

"I think the teachers do a great job, but they don't always have all the resources that keep the classroom hands-on and give the kids more experience and a broader perspective of science," Bryant said. "We (in extension) are able to come in and provide the cockroaches, the colonies, and the supplies for these different hands-on labs; I think it really helps the teachers."

Bryant conducts an evaluation at the end of each school year to see who is interested in pursuing a science career or taking more science classes. About 40 percent of the students said they wanted to go into a science field and/or keep taking advanced science courses.

"Since that is generally higher than the state and national averages, that makes me feel like we're having an impact on the kids," she said. "We're also not seeing any difference between the boys' and girls' interest in science, so that was encouraging. We're keeping the girls excited about science and in maybe pursuing some kind of science career."

But even if these students don't ultimately take up a career in science, they still derive benefits from the classes—benefits like honing leadership and communication skills.

Mary Arthur and Andy Hoyt discuss the rate of decomposition of leaf samples in The Arboretum in Lexington.

Critical Pathways

Science education helps the mind develop critical pathways. Campbell Junior High School science teacher, Shelly Chestnut, sees the change in her students in 7th grade.

"They come in, still very concrete in their thinking, very much hands-on," she said. "As we progress through the school year, they start building their own understandings, developing the abstract thinking part of their brains. They start manipulating the materials themselves, and I will no longer have to give them directions."

Chestnut, too, opens her classes to 4-H agents, in this instance, Clark County's Rachel Noble and Heather Cassill. Toward the end of the school year, the agents bring in the Physics Zoo, developed by UK physics professor Joe Straley, to recap lessons learned throughout the year. In pairs, the 7th graders move from station to station, describing how each exhibit works and what it's intended to do. The small roller coaster track and a wooden ball illustrate force. A box with a lens shows how a simple camera works. A periscope demonstrates that the angle of incidence is equal to the angle of reflection. There's excitement in the room whenever partners arrive at the right conclusion.

Young Scientist

"When you come down to it, the scientific process is very logical; it's a thought-out, step-by-step procedure for looking at something. You can apply it to other things in your life, certainly," high school student Andy Hoyt said. "It really teaches you to think analytically."

This past school year, when classes ended for the day at Lexington's Henry Clay High School, Hoyt, 18, headed to Professor Arthur's forestry lab, an opportunity afforded by The Academy, a four-year high school program that ends in the senior year with a 200-hour project mentored by a professional. Being able to join Arthur's research team was an eye-opener in the scientific method for Hoyt, who is interested in life sciences, ecology in particular. It also provided him with a rare opportunity to become the lead author on a scientific paper that the research team hopes to get published.

Arthur was seeking an answer to how invasive plant species change the way plant material is cycled through ecosystems, whether they speed up the rate of decomposition and, if so, what implications that has for soil chemistry. Hoyt joined the study about a year in. He was able to finish the data collection and do the data analysis and sample processing.

It's everything about how the world works.

"Not many high schoolers get to do this, which is pretty exciting, because with that on my resume, I'm more likely to get a research position as an undergraduate in college," Hoyt said.

Critical thinking, opportunities for successful careers, a broader perspective. A strong foundation in science in school is important in developing such things. Goodin believes it's never too young to start.

"At some point, they're six, and the world is opening up in front of them, so give them that chance," he said.

Arthur said her grown older daughter, who is not a scientist, said to her, "I don't understand how anyone could not think science is interesting, because it's everything about how the world works."

"That's what is important about science; it helps people understand how the world works and helps them become interested in the world." Arthur said. "I see that as part of being a good citizen." ◆

The Drip, Drip, Drip of Success

When Myanmar's farmers adopted drip irrigation, it changed their lives. UK extension specialist Brent Rowell had a lot to do with that.

After a dozen years as state extension specialist for vegetable crops, Rowell left UK in 2006 to work for International Development Enterprises, a nonprofit organization based in Denver. IDE was starting a new program in the Southeast Asian country of Myanmar (formerly Burma) to develop and manufacture simple low-cost irrigation technologies such as foot-powered pumps combined with drip irrigation. Rowell had been working with Kentucky vegetable growers on small farm drip irrigation as part of his extension horticulture position at UK.

"Myanmar was a couple of decades behind. They were even a decade or so behind their neighbors in Thailand and Vietnam," said Rowell.

Rowell estimates that 70 percent of the country's 51 million people are involved with agriculture in some way, but they still have a long way to go in terms of technology, improved varieties, pest management, mechanization, and irrigation. A lot of that can be attributed to 50 years of military rule, conflict, and self-isolation. That changed in 2011 when a civilian government took over. Things are now opening up.

Rowell held many on-farm demonstrations to give farmers the opportunity to try the new system.

"'That can't possibly work; there's not enough water,' was the universal response," he said. "They had a lot of catching up to do, but they are very quick at catching on."

IDE-Myanmar's new drip system, using low-pressure gravity tanks and locally made drip irrigation tape, is now known throughout most of Myanmar.

"What we were doing was life-changing for them," Rowell said. "That's why we were doing it. Farmers, both men and women, would have to carry two large sprinkling cans filled with water, and make hundreds of trips over one commercial-size field. They would carry between 200 and 400 tons of water for one crop. It was backbreaking work."

Rowell said when Burmese farmers switched to drip irrigation, they had more time to accomplish other things, like expanding their plots. They were relieved of a tremendous burden and usually doubled their income from high value horticultural crops.

After six years in Myanmar, Rowell and his family returned to Lexington. Rowell is now the extension specialist in international and sustainable horticulture in the College of Agriculture, Food and Environment.

PHOTOS PROVIDED BY BRENT ROWELL

He was instrumental in creating a partnership between the college and Yezin Agricultural University, the only agricultural university in Myanmar. As a result, UK is the first American university that YAU has signed a Memorandum of Understanding with since the 1970s.

Rowell has been back to Myanmar twice since he returned to the U.S. in 2012 and is helping UK position itself to recruit potential students from there and also help YAU with its own curricula, research, and outreach programs.

"UK has a lot to offer them in terms of ag training, appropriate technology, sustainable ag, and mechanization," said Rowell. "And they are very willing to work with us."

Why Not Here?

Rowell's work in Myanmar caught the attention of fellow faculty members in the UK Horticulture Department. If his gravity-fed drip irrigation system worked in Myanmar, why not in Kentucky? UK Assistant Professor Krista Jacobsen was working with Berea College-based Grow Appalachia to examine sustainable and organic specialty

cropping systems. Together they were extending high tunnel greenhouses throughout Eastern Kentucky. Rowell demonstrated his work for them, and they were sold.

"Brent had done a lot of the leg work and precision tests in Myanmar, and knew what to do to make these things work here," Jacobsen said. "Our farmers had been trying these kinds of systems with drip irrigation and rainwater tanks, but they hadn't worked out some of the kinks that Brent figured out in Myanmar."

Last summer, Rowell, Jacobsen, and Grow Appalachia set up prototypes of the simplified drip system in high tunnel greenhouses. They developed a way to catch rainwater and pair it with ultra-low pressure drip systems. The high tunnels could then stay off the grid in remote places or areas where it is difficult to get water.

Two such locations were a vegetable farm in Laurel County and UK's Robinson Center for Appalachian Sustainability in Breathitt County. Both sites also used solar pumps to get the water to gravity tanks.

"People really liked it," said Jacobsen. "They combined it with some irrigation monitoring tools and had a better handle on how much water they were using. They were watering better; it was a very easy system."

The grower in Laurel County had never had such high tomato yields as he did last summer.

Jacobsen calls Rowell an "outside the box thinker" and said he inspires her.

"I think it says a lot about a faculty member, and his commitment to global agriculture and farmers worldwide, that he would be willing to leave a tenured position to work with some of the world's poorest farmers who need hands-on assistance the most," she said. ◆

—Jeff Franklin

Chia Moves North

Part of the mint family, chia has historically been an important food crop in Central and South American countries. High in omega-3 and omega-6 essential fatty acids, chia seed is gaining popularity in the United States, not only for the health-conscious, but also for use in livestock and pet food.

It's not grown in many U.S. locations; shorter growing seasons prevent the late-flowering chia from fully maturing. One farmer, Chris Kummer, Agronomy '90, is determined to overcome that problem.

In 2011, he began working with UK Department of Plant and Soil Sciences researchers Tim Phillips and David Hildebrand, who were busy developing a non-GMO early flowering chia.

"Chris is innovative in the crops he grows and how they are marketed," Phillips said. "He has supported our continued research and breeding improvement of chia for Kentucky."

"I grew about three acres that first year just to see how it would work," Kummer said. "The next year, we produced the first commercial crop of early flowering chia in the world, right here in Simpson County."

In 2012, Kummer founded Heartland Chia to develop and commercialize early flowering chia as a new crop opportunity. He still works with Phillips and Hildebrand to share information and evaluate opportunities as they develop this new crop.

Food safety is important, since chia can be used directly as a food product. Kummer is developing a closed-loop production model for sustainable production in the United States that will ensure buyers have a reliable, domestic source of chia.

"Chris is working on getting more producers in Kentucky and other states to grow it, but we still are figuring out the best way to grow chia, control weeds, and harvest the yield," Phillips said. "Once he has developed the market for this new chia, acreage will expand quickly."

Kummer is also working with the Kentucky Center for Agriculture and Rural Development to help evaluate and develop various aspects of the business.

"Working with UK on the production side and KCARD on the business development side has helped us move ahead quickly," he said. "Now we are focusing on marketing the product beyond the farm gate and making connections with food manufacturers. These relationships are critical as we develop this opportunity and involve more farmers."

Kummer believes Kentucky grain farmers will find that chia fits in well with what they are used to doing; it will be a good second crop to follow wheat since it has a lifecycle similar to soybeans. Farmers also can use traditional equipment, so they won't have new investments in order to get started.

"It has been a great collaboration working with the college and especially Drs. Hildebrand and Phillips. Without their initial vision, none of this would be possible," Kummer said.

—Aimee Nielson

UKAg researcher Tim Phillips (l) and farmer Chris Kummer have collaborated to develop an early flowering chia.

PHOTO PROVIDED BY CHRIS KUMMER

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