

FALL 2013

THE

magazine

UNIVERSITY OF KENTUCKY

COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

The Food Issue

Kentucky Cheese: Coming of Age

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A Taste for Success

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Kentucky is Apple-icious

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....from the dean

Last Column

I have spent much of my time over the last several months talking about and planning for my transition out of the dean's office during this, my thirteenth year in the position. Although I will heartily enjoy the much greater flexibility in schedule and activities, there are many rare gifts I expect to miss deeply when my term as dean of this college has ended.

I will miss working every day with very talented faculty and staff who are fully committed to their work and believe in its value.

I will miss having the entire commonwealth as my campus, with its wonderful diversity of agriculture, resources, and communities.

So often, people introduce themselves just to share their own stories and history as students, parents, employees, Extension volunteers or users of our services. Because their stories are happy much more often than not, I will miss that.

Not everyone has had the opportunity to watch significant, beneficial change knowing that the people you work with had a role in creating that change. I will miss this manifold, because I have witnessed it several times: the diversification and growth of Kentucky's agricultural economy, advances in conservation and environmental quality, the growing public enthusiasm for food and farming, and breakthroughs in science and technology.

I will miss being the voice, the representative, and the leading advocate for this great land-grant College of Agriculture, Food and Environment.

I won't have to miss the rewards of watching students not only learn, but understand, because I plan to continue a little teaching.

And I will not miss watching the continuing success, impact and advancement of the College, because I will still be around to



watch the eleventh dean, along with all our great employees and supporters, sustain that excellence. As I am very confident they will.

I thank all of you for the privilege, the honor, of serving and leading our college.

M. Scott Smith
*Dean, College of Agriculture,
Food and Environment*

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4-H: Serbia's Answer to an Old Problem

There's a World War I-era song with lyrics by Sam M. Lewis and Joe Youngsong that asked "How ya gonna keep 'em down on the farm after they've seen Paree?" The question was relevant then, when droves of 20th century Americans abandoned farming for jobs in the city, and it's relevant today as Serbia experiences the same rural exodus.

The Serbs are hoping at least part of the answer lies with using 4-H to teach their young people how to make a living through farming and entrepreneurship.

"The idea is to combine traditional 4-H programs and the youth entrepreneurship that we do in the States and provide them not only with the skills pertaining to the rural activity, but also give them a way to make some money on the farm and in the communities," said Mary Averbeck, 4-H youth development extension agent in Kenton County.

Averbeck was one of several UK College of Agriculture, Food and Environment folks, including 4-H cooperative extension specialists Carol Hanley and Martha Welch and Cumberland County 4-H youth development agent Elijah Wilson, who added Serbian stamps to their passports over the past year, traveling under the auspices of the U.S. Department of Agriculture. They spoke at national conferences and met with extension agents—they're called extension advisers over there—to explain our programs and advise them on starting clubs.

Averbeck visited in January, June, and September.

"I had no idea what to expect when I visited for the first time," she said. "Serbia is a lot like Kentucky, except they have Belgrade, which to me, is a mini New York City. Most of the people in the rural areas are where most of our families would have been in the fifties. They're not the consumer culture we are. And as a country, they're very focused on eating nongenetically modified foods and a lot of organics."

— Carol Lea Spence



Some of the first 4-H'ers in Serbia. Serbian officials are hoping 4-H will provide young people with the tools to be able to stay on the farm and make a good living. Photograph provided by Mary Averbeck



A meal on a Serbian farm. (l-r) The younger woman is a 4-H leader. The men are the director of extension in Vranje and an extension advisor, respectively. Photograph provided by Mary Averbeck

On that first trip, she gave an overview of Kentucky 4-H and an in-depth look at youth entrepreneurship at an all-country extension conference, then traveled into the country where she gave six more presentations at extension offices and high schools.

When she returned in June and September, Averbeck was able to see how far the three groups had come. About 30 teenagers in a 4-H club in Vranje, a city in southern Serbia, worked on one of four different projects combining agricultural production and entrepreneurship skills—beekeeping, vegetable or fruit production, and growing field crops.

Averbeck was impressed to see they were up and meeting with success in a very short time. When she asked one 4-H Serbian teen if it was what he expected, he echoed the feelings of many 4-H'ers in Kentucky.

"No, it is better!"



(l-r) Ryan Chaplin, Scott Kohn, and Gregg Rentfrow display an array of cuts from a side of pork.

The Meat of the Lesson

"This is a unique collaboration," said Gregg Rentfrow, meat scientist in the Department of Animal and Food Sciences. "I don't know of any other relationship between a university meats lab and dining services department."

Rentfrow was referring to the relationship between the University of Kentucky College of Agriculture, Food and Environment Meats Lab and UK Dining Services. The

partnership makes local food more available to the UK campus and the surrounding community by expanding the use of local foods, including beef and pork in campus dining facilities.

"With the partnership of the meats lab, we can train our staff in primal cuts, and it saves us money," UK Dining Services Chef Scott Kohn said. "Now our test products can become a reality. For example, we make our own UK genoa salami."

Rentfrow, Kohn, and Meats Lab manager Ryan Chaplin recently opened a butcher shop, where people from on and off campus can buy quality local meats.

The shop offers a variety of products including dry-aged ground beef, dry-cured bacon, breakfast sausage, ground chorizo and chorizo snack sticks and a few unique items like a cheese bratwurst called Wildcat Tail, bourbon apple bratwurst made with local apples and Kentucky bourbon, and an array of spices.

Rentfrow said UK students are the ultimate beneficiaries of the partnership.

"It allows us to show our students what happens beyond the farm gate and beyond the grocery store," he said. "It's a full-circle education."

The butcher shop adds value to animals harvested from UKAg farms. The profits fund livestock, dairy, and meats judging teams, and facility maintenance and repairs.

The shop is open in the basement of the Garrigus Building Wednesdays and Fridays from 1 to 5 p.m.

— Aimee Nielson

CERTIFIABLY SAFE

Beth Brosmore of Kenton County wanted to sell her jalapeño pepper jelly. Kentucky, however, requires producers to be certified to sell high-risk items like salsas, relishes, and canned vegetables at farmers markets and roadside stands. Brosmore turned to the go-to place for producers who want to take the step into value-added production—the UK College of Agriculture, Food and Environment.

Since 2004, the College has offered the home-based microprocessing workshops required for certification. Nearly 1,000 people have attended one of these workshops led by Sandra Bastin, UK Dietetics and Human Nutrition chair and certified culinary educator. Some get their recipes certified and begin selling high-risk products. Others may decide to sell lower-risk items such as jams and baked goods as home-based processors. Kentucky has 85 active, certified home-based microprocessors and 675 active home-based processors.

"Before I attended the workshop, I was unaware of how important testing the pH was to food safety," said Brosmore, who had been canning for years. "Nowhere had I seen that information but in this class. Fortunately, the products I use gave my jelly a safe pH."

— Katie Pratt



New Name, New Vision

Graduates from the College of Agriculture, Food and Environment have seen success in management roles at restaurants, resorts, and retail stores or by becoming merchandisers, buyers, event planners, and designers. To give students an even greater competitive edge upon graduation, the Department of Merchandising, Apparel and Textiles and the Hospitality Management and Tourism program have merged to become the Department of Retailing and Tourism Management.

"The two groups were combined to better meet the needs of two vibrant industries," said Vanessa Jackson, department chair.

As part of the merger, the department's nearly 300 undergraduate students have a new curriculum this fall that includes expanded and creative, enhanced learning opportunities such as a revised internship program.

The department is also putting together an advisory board of alumni and other professionals active in the retail and tourism industries.

"We want to be the source of innovative interdisciplinary programming that partners with industry, consumers, and educators," Jackson said.

— Katie Pratt

see blue.

Scott Smith is retiring this year as dean of the UK College of Agriculture, Food and Environment, but he's heading for the classroom, not a rocking chair.

Q: Do you plan to continue in a post-retirement capacity?

A: I am going to work my way out gradually. I hope to do a little bit of teaching and some writing after I step out of the dean's office. I plan to be a faculty member in Plant and Soil Sciences, where I began my career, and it looks like I will end it there as well.

Q: What will you teach?

A: I have signed up to teach GEN 100, the freshmen issues in agriculture course. That is something I can deal with, without a lot of rehabilitation.

Q: Does that mean you won't be leaving Lexington in the near future?

A: I am here for life. The family connections are too great. We have been here too long, and this is home. I don't know of another place I would rather spend my time.

Q: Did you see yourself in Kentucky for your entire career when you came to UK in 1978 after completing your doctorate at Michigan State?

A: It did not take long for me to form an attachment. I loved Kentucky and the College of Agriculture from the very beginning. I did, early on, have some opportunities and evaluated those and decided that this was the best place for my family and me.

Q: What would you like to hang your hat on that was accomplished during your time as dean?

A: I am proud of the contributions the College has made to the advancement of Kentucky agriculture and the Kentucky economy in general. We have been very, very responsive, high-impact public servants through the good work of many, many people across the state. I would also put a high priority on the College's ability to adapt in terms of our undergraduate populations and our degree programs. We certainly have been innovative in terms of what we have done for our students and the opportunities we have offered them with new and different majors.

Dean M. Scott Smith

Q: About halfway through your administration you were tapped by then President Todd to be interim provost while also running the College. How difficult was that?

A: It was very demanding. It helped me refine my skills of delegation. There is a lot of great leadership in the College, and I was fortunate to pass on a lot of the responsibilities while I was gone. It helped me appreciate the differences in our college and other colleges on campus. It was really a tremendous education and a valuable experience, but I can't help but admit I was glad when it ended.

Q: One of the most difficult situations you dealt with was when Mare Reproductive Loss Syndrome hit in 2001, early in your administration. What are your reflections about that?

A: Somebody ought to write a book about that. It was a unique experience for me, because it was out of my field. There were enormous expectations and pressure on the College of Agriculture. It was an incredibly complicated and difficult problem. I don't think the people who worked on it have ever gotten the full credit they deserve for addressing such a unique crisis. In my view, they neutralized a potentially devastating threat to the Kentucky Thoroughbred industry.

Q: How do you feel about the College's name changing during your administration?

A: I have mixed feelings, because the College of Agriculture is such an iconic, historic label. We didn't change it lightly, I can assure you that. I think it was a better way to speak to people about what we can do and what we can do for them and the economy.

Q: What do you see yourself doing with the extra time you'll have on your hands?

A: I want to start reading books again. I plan to do some volunteer work. I hope there are ways I can continue to serve in the community, maybe in different ways than I have as dean.



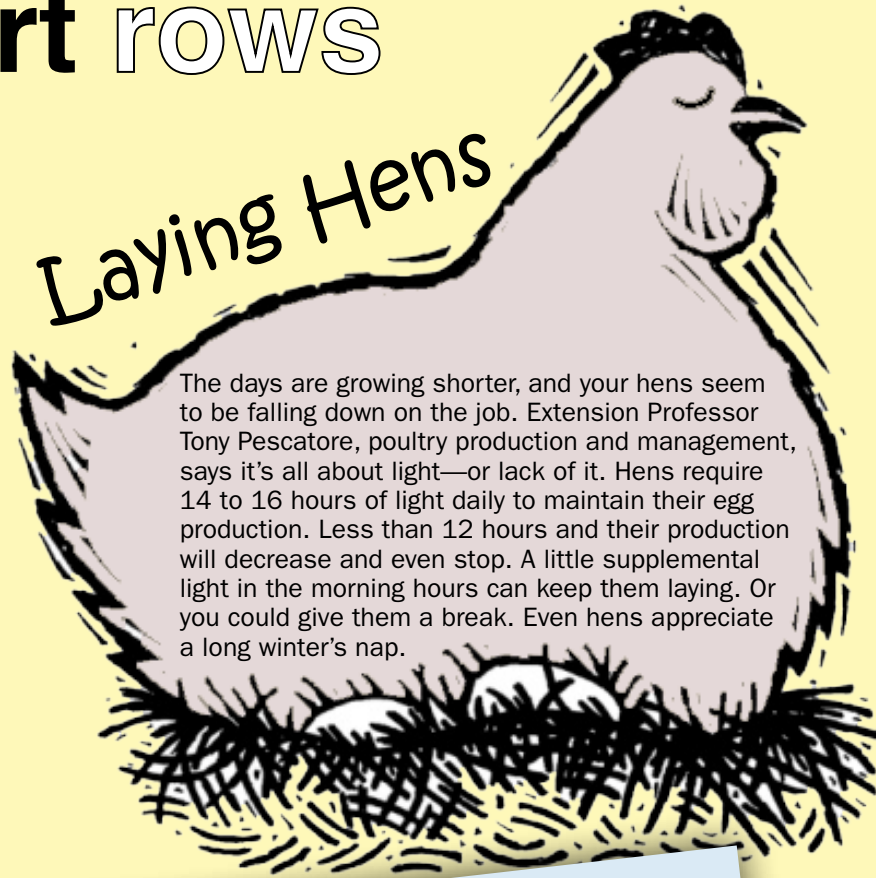
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Honored for their **MANRRS**

UK Minorities in Agriculture, Natural Resources and Related Sciences, was named Chapter of the Year by the national organization. UK members, Erica Flores and Jessi Ghezi also brought home three individual awards, and group adviser Assistant Dean for Diversity Quentin Tyler won National Adviser of the Year. Tyler said the awards recognize outstanding students who can compete at a very high level. "The College is a place where all students can develop their talents and reach their goals and dreams."



Laying Hens



The days are growing shorter, and your hens seem to be falling down on the job. Extension Professor Tony Pescatore, poultry production and management, says it's all about light—or lack of it. Hens require 14 to 16 hours of light daily to maintain their egg production. Less than 12 hours and their production will decrease and even stop. A little supplemental light in the morning hours can keep them laying. Or you could give them a break. Even hens appreciate a long winter's nap.

Preserving LOVE'S Patchwork

Grandma's quilt, much used and much loved, may be frayed and stained, but it might not be beyond repair. Marjorie Baker, extension associate for clothing and textiles, says a hand-sewn quilt should always be mended by hand, and if fabrics are worn away or torn, they should be strengthened by reweaving or darning; all things a trained conservator can do. Another option for restoring worn areas is to cover the area with a hand-sewn patch made from period reproduction fabric.

More Valuable than Gold

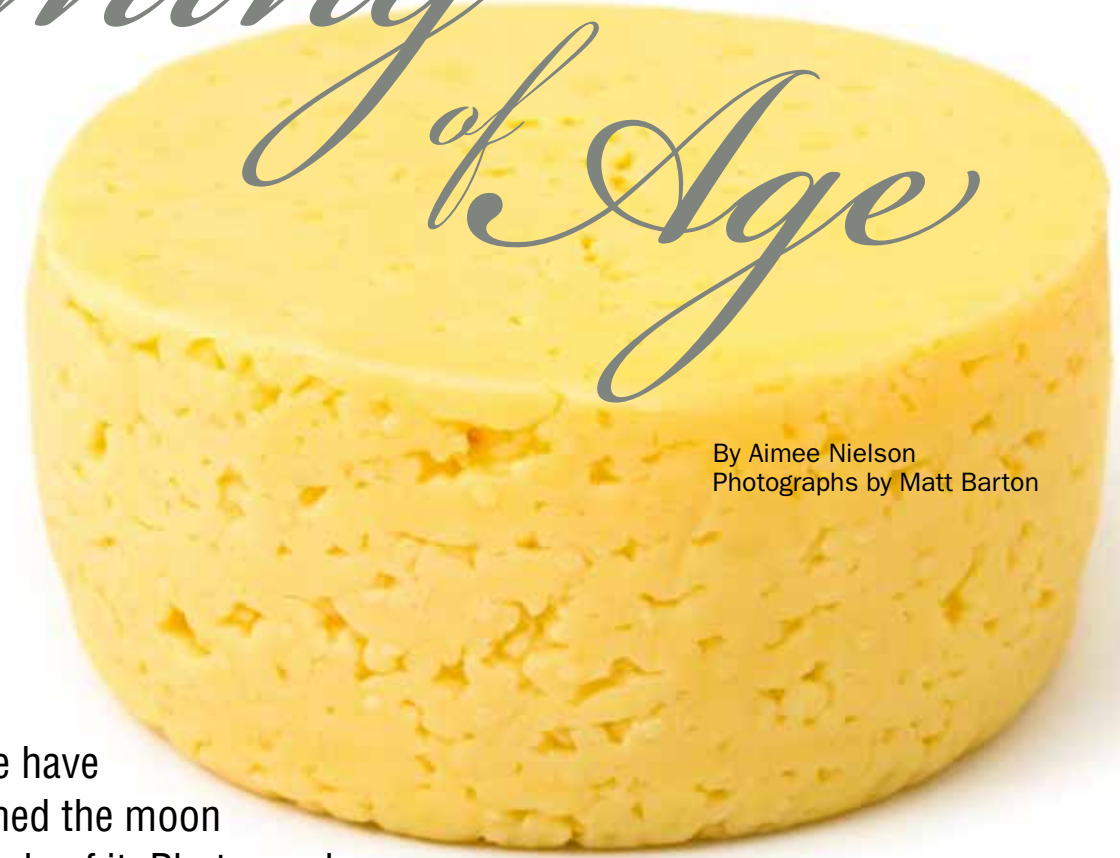
Cinnamon has a pretty spicy history. Armies fought and massacred to acquire it and empires grew rich on it. Depending on the culture, it was used for embalming, as perfume, or as a food flavoring. It was variously considered a medicinal treatment, an appetite stimulant, or even an aphrodisiac. Today, researchers are taking a fresh look at cinnamon. Dietetics and Human Nutrition's Professor Lisa Gaetke said recent studies have suggested that cinnamon may reduce blood glucose concentrations and be anti-inflammatory. Enjoy the spice and watch for information on health advantages that will come with further research. Hold the massacres, though.



Kentucky Cheese:

Coming of Age

By Aimee Nielson
Photographs by Matt Barton



People have claimed the moon is made of it. Photographers ask their subjects to say it. Many mice have fallen victim to a pinch of it, and the average American annually devours more than 30 pounds of it. Be it bleu, white, fresh, aged, melted, salty, or sweet, people everywhere have a love affair with cheese.

Cheese has been around since people began breeding livestock. Historical accounts explain that travelers from Asia brought cheese making to Europe where the process was adapted and improved. The Pilgrims brought cheese to America aboard the Mayflower, and now the United States makes about 25 percent of the world's cheese supply to the tune of about 9 billion pounds per year. And with more than 2,000 varieties, there's plenty to choose from.



Upside down in the center of a wheel-like web, garden spiders (black and yellow argiopes, pronounced ahr-GUY-oh-pees) can be a startling sight in the late summer and fall. Be fascinated, not worried, because these arachnids—three inches from claw to claw—are benign (to humans) and beneficial, devouring grasshoppers, flies, and aphids. Their other name, writing spiders, comes from the zigzag pattern they weave into the web. UK entomologist Lee Townsend said people once thought the "zipper" provided structural integrity, attracted flying insects, or warned birds to veer away, but no one really knows, and "the spiders aren't talking."

The Key Was Value-Added

Growing up in the suburbs of Indianapolis, Kenny Mattingly didn't know much about dairy life until, at age 19, his family moved to a 200-acre farm in Barren County. There he quickly found "the same crazy passion about dairy" his father had.

As Mattingly got older, concerned about the future of milk, he started researching ways his family could stay on the farm and make a living. He knew adding value was going to be the key. His family began to handcraft Gouda cheese with their own milk in 1998. They made about 4,000 pounds. Last year, Kenny's Farmhouse Cheese sent more than 100,000 pounds of cheese out to 13 states. They even had their product on the menu at golf's Masters Tournament a few years ago.

"The reward for me is knowing this cheese started with grass on my farm and cows we've raised for generations that produce high-quality milk," Mattingly said.

These days Mattingly, his family, and a few employees milk 140 cows—about half of them Holsteins and the other half a mixture of crossbreeds and European breeds such as Swedish Reds and Milking Shorthorns.

Of the nearly 25 varieties of cheese available from Kenny's, aged white cheddar sells the best. His personal favorite is the Barren County Bleu.

"We use the same type of process as when we started, just a bigger vat (600 gallons)," he said.



An Age-Old Process

After raw milk is pasteurized by heating it to 165 degrees for 18 seconds, cheesemakers add culture, let it ripen for about an hour, and then add rennet, a complex of enzymes, to cause the milk to coagulate into a flat thickened layer, the curd.

Once coagulated, the milk gets cut into small cubes of delicate cheese curds, which the cheesemaker will gently stir using a type of cheese squeegee to separate them from the surface of the vat and the whey, a liquid with water-like consistency. This process allows the curds to heal before the mixture is carefully heated to a temperature of 88 to 90 degrees depending on the type of cheese that's desired. The whey is drained, and the curds are pushed to the sides of the vat where they will "knit" together. After cutting the knitted curds into slabs, the cheesemaker turns them every 20 minutes, checking the pH to get it just right. And then it's salted. Salt acts as a preservative and draws out extra moisture. It also enhances flavor and promotes the natural aging of cheese.

The salted curds go into molds with lids that press the curds to about 40 pounds per square inch. Next, the cheesemaker removes the hoops and begins the aging process or packages the cheeses that are ready to sell.

Kenny Mattingly considers cheese making to be an art form, an art that begins in the pasture and ends in a "cave," a cheese cave.



Savvy Sound Science

Clark County goat farmer and farmstead goat cheese producer Susan Miller grew up at a time when "it seemed that women just didn't do adventurous things. But I wanted to be a chef... or a veterinarian, and look what happened. I take care of these animals and create cheese. Each time I make cheese, it's just like magic. I don't know all of the science of why it happens, but it amazes me every time."

University of Kentucky researchers know the science and are working with cheesemakers like Miller and Mattingly to bolster the cheese industry small and large. UKAg animal scientist Clair Hicks has spent many years researching the science behind cheese. He currently is researching the acoustic fingerprints of bacteria. That's right; bacteriophage (a virus that infects and replicates within bacteria) makes a lot of noise when it attacks good bacteria. And Hicks's recent studies have shown that biological processes within bacterial cells produce measurable ultrasonic acoustic emissions. By "listening," he can tell the difference between good bacteria and those that produce unclear flavors and grassy textures in cheese.

"We can actually hear when the bacteriophage injects its DNA into the cell and infects the cell," he explained. "We used to think the mechanism inside the cell set the timing for the bacteriophage replication, but now we are learning that the cell really just kind of loses control of itself once the foreign material enters."

Hicks said the findings are really important for cheesemakers, because if bacteriophages are in a vat from a previous batch or even in the air, they can disrupt the entire process of the next vat. So, it's important to stop the infection process early on.

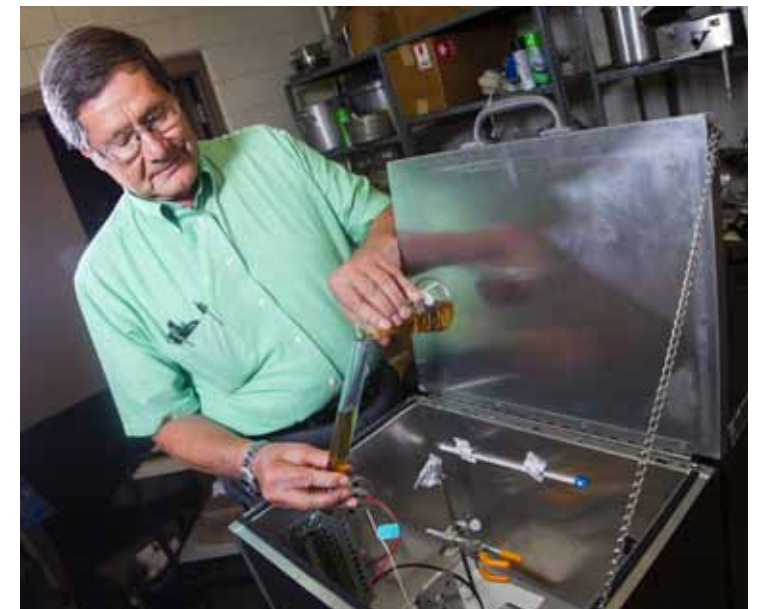
"The acoustic properties now can virtually tell us immediately what bacteriophage we're dealing with and what cultures to use to counteract it," he said.

UK is also the leading institution for agglutination research. Agglutination is simply the clumping of bacterial cells. In the cheese world, this is important to those who make soft cheeses from skim milk such as cottage cheese, ricotta, even sour cream. Hicks said, over the years they have developed agglutination-control technology that is widely used in the cheese industry.



Susan Miller drains the whey from goat milk curds. "Each time I make cheese, it's just like magic.... It amazes me every time."

Clair Hicks, shown filling a tube with culture media, can listen to the acoustic emissions of bacteria in cheese and determine which ones will produce unclear flavors or grassy textures.



Age Does Matter

Late actress Billie Burke once said, “Age doesn’t matter, unless you are a cheese.”

At Good Shepherd Cheese in Bath County, Sanford and Colleen Dotson pioneered the first sheep dairy in Kentucky. With a pasteurizer costing at least \$15,000, they decided to make raw milk cheese “for a while, at least,” which means all their cheese has to be aged at least 60 days.

Sanford Dotson said, while that’s the minimum requirement, their cheese is probably better around 90 to 120 days.

In 2012, the Dotsons made 60 batches of artisan hard cheeses with names like Pyrenees and Wild Mountain Thyme. Each batch makes six wheels, and each wheel weighs from six to eight pounds.

Inside the Dotson cheese “cave,” the temperature is 55 degrees with 85-percent humidity. They are beginning to add bleu cheese to their offerings.

“I actually hand salt these for about the first five days,” he said. “You wait about two weeks and turn them and flip them. And you poke holes through it. The blue mold is already in here; we put it in the milk. The holes will let oxygen get in there, and hopefully we’ll get stripes of blue mold in the cheese.”

Dotson said he hopes to get an open texture where it will start getting in through the cracks in the cheese, though he often goes in and scrapes the

blue mold off the exteriors to keep them “pretty.”

“The American public is not used to seeing mold. They’re used to seeing cheddar with the rind cut away and Colby with the rind cut away,” he explained. “But when you’re getting it from the farm, you’re getting the real stuff. We sell it with the rind on it. We want people to have the same experience they would if they were in France walking along the market street.”

Oh, the Rules and Regs

Seven years ago, Miller had never owned a goat or made cheese. She thought it was a joke when a friend said, “Wouldn’t it be great if we could just run away and make artisan cheeses?” That turned into a weeklong adventure in New England, visiting farms, making cheese, and developing a passion for it.

“I came back and realized I was going to have to set up a goat dairy and do this right,” she said. “So I started the process, bought some goats and worked through massive amounts of regulations. For three years, I milked and practiced making cheese in old barns and buildings here on the farm.”

Miller’s venture became the first goat dairy in Kentucky. She learned early on that inspectors and regulations are a huge part of the cheese making process. Kentucky cheesemakers have to know and follow Kentucky Milk Branch Regulations and portions of the Federal Pasteurized Milk Ordinance



Susan Miller has become deeply attached to her goats. For her birthday, her husband gave her a playground for the animals' entertainment.

and the U. S. Department of Agriculture dairy regulations. To even set up a dairy, they have to work with local health inspectors, zoning boards, water quality and septics inspectors and comply with regular health department inspections. If the operation has a pasteurizer, it has to be approved and then tested every three months.

Lewis Ramsey is a milk inspector for the Kentucky Milk Safety Board.

“We take (milk) samples four out of six months,” he said. “If there are any problems, we come back earlier the next time to make sure those are all worked out.”

Before cheese plants can open operations, they have to have a permit from the state. Then they have to have routine plant inspections and farm inspections once every three months.

All sheep, cow or goat milk that goes into cheese must be tested for antibiotics before it can be sold. Dotson brings a sample from every batch of milk in to campus. There, UK Regulatory Services tests for antibiotics. Some producers have the testing equipment in their own plants, but for those who don’t, Regulatory Services can do it for a minimal fee.

The Demand’s There

Miller recently started purchasing extra milk from a new dairy in Nelson County, Dalton's Double D Dairy. This will allow her to increase production from her current weekly 30 to 40 pounds of fresh, spreadable goat cheese she calls Bleugrass Chevre. She will also make feta cheese and a bloomy rind cheese she dubbed “Bloomin’ Bleugrass” that she will continue to sell weekly at the Louisville and Lexington farmers markets.

“The biggest challenge of it all is keeping up with demand,” she said. “That and keeping the animals healthy takes a lot of time and effort. I have three jobs—taking care of animals, making cheese, selling cheese—and it takes more time than I really have.”

Each year, new cheesemakers enter the arena with a lot to learn, but they can take heart that others have successfully paved the way before them. From the humble beginnings of small-batch experiments to artisan offerings fit for international event menus, Kentucky cheese is coming of age. 🌿



Sanford Dotson cuts the curd into smaller pieces. Every cheese boasts its own terroir. "You can't make this anywhere else; it won't taste exactly the same, because you taste the land in the cheese," Dotson said.

A Taste for Success

By Katie Pratt
Photography by Stephen Patton

It's the dream of many food industry entrepreneurs to see their product on the shelves of a regional or national grocery chain, but getting there is not so simple. In addition to the obvious hurdles of food safety regulations and production costs, things like market research, taste comparisons, process validation, shelf life studies and labeling considerations will need to be determined and completed before products can line those shiny, white shelves.

Entrepreneurs can spend hundreds of thousands of dollars accomplishing these necessary and important steps with private companies across the United States, or they can come to the University of Kentucky College of Agriculture, Food and Environment. For the past three years, specialists with the College's Food Systems Innovation Center have helped large and small, new and established entrepreneurs fulfill these same requirements at a much lower cost. The center places particular emphasis on helping Kentucky-based food firms develop commercial quality products.

"The center is filling an enormous need," said Tim Woods, UK agricultural economist. "There are a lot of clients that are farmers market based that are looking to ramp up to the next level, and the center gives us the opportunity to deliver a whole suite of educational training programs to help them get there."

Since it was established in 2010 with funds from the Kentucky Agricultural Development Fund, the center has served more than 520 clients, with the number increasing each year. While there is an emphasis placed on helping Kentucky-based companies, companies across the United States have used the resource.

Science and Innovation

Though the center is young, College specialists have been offering their expertise to companies for many years.

Winston Industries has had working relationships with specialists even before the center's formation. The Louisville company employs about 150 people and gained initial prominence for developing the fryers used to cook KFC chicken.

In addition to the fryers, they've developed and marketed several other breakthrough technologies in restaurant equipment including CVap ovens. CVap is the company's technology that allows oven operators to control air and food moisture temperatures. Controlling both temperatures allows foods to reach and maintain their optimal level of doneness and



texture for a longer period of time. CVaps are used around the world by the food service industry from fast food to professional chefs to school cafeterias.

For the past five years, Chef Barry Yates, director of innovation at Winston Industries, has brought the company's CVap ovens to Melissa Newman, the center's director and UK associate professor of food microbiology and food safety. They've collaborated on several process validation studies.

"I think it's one of the more unique relationships between a university and a business across the country," Yates said. "They're about innovation, and we're about innovation. They're about science. We're about science."

The first project Yates and Newman worked on was validating the safe processing of proteins in the CVap ovens. Currently, they are in the midst of a process validation project to determine the oven temperature needed for food to reach an optimal level of quality and doneness and maintain federal food safety standards.

"Process validation is critical to where we're going now, because we're hoping to change the food code," Yates said. "I need a nonbiased, third party that uses scientific methods to validate what we're doing is safe. The U.S. Department of Agriculture is not going to pay any attention to us on this until we can bring them verified third party data."

Newman agreed. "For a study like this, the USDA is going to want to see that you're not perpetuating the growth of bacteria, you're not making a product that's on the edge of being dangerous, and that product is foolproof to the point that individuals who are new or untrained in the food service industry can safely operate it."

One-Stop Shop

The center has allowed College specialists to streamline their services into a one-stop shop for established and budding entrepreneurs. As the center's coordinator, Angela Anandappa is usually the first person a potential client will speak to. She helps clients go through the required permitting processes, performs nutritional evaluations, and initiates



(opposite l-r)
UKAg's Melissa Newman,
Winston Industries' Chef
Barry Yates, and founder
Winston L. Shelton have
collaborated on several
process validation
studies of innovative
restaurant equipment
that could change the
food industry.

discussions with the proper UK specialists.

"Every project is customized to meet the needs of the individual clients," Anandappa said.

Newman conducts shelf life and food safety studies. UK meat scientist Gregg Rentfrow specializes in meats and sensory panels. Woods and fellow agricultural economist Wuyang Hu perform market studies and help clients with all aspects of marketing. Joe O'Leary, UK extension associate professor in Animal and Food Sciences, examines preparation methods of canned products and determines whether they meet Food and Drug Administration food safety regulations, a review that is required before products can go on the market. O'Leary is one of only a handful of FDA process reviewers in the state.

Professional and Convenient

Paul Inclan from Bourbon Country Products in Louisville is another of the center's clients. In 1991, the company took over production of Maker's Mark Gourmet Sauce. Since then, it has worked with Heaven Hill Distilleries and Wild Turkey to produce various sauces infused with the different bourbons. These products are sold across the United States, mostly in specialty stores, and are beginning to go international with the soaring popularity of bourbon.

The company's partnership with the bourbon parent companies is vital to its success. When Wild Turkey came under new ownership, the

new owners wanted a taste comparison of the company's Wild Turkey bourbon, habanero, and gourmet sauces to several other similar sauces on the market.

"There were several companies that would perform the service in California and New York, but everything was very expensive," Inclan said.

While he doesn't remember exactly how he found UK's Food Systems Innovation Center, he was very pleased with the results of the sensory panel study conducted by a Rentfrow-led team. So were the Wild Turkey owners. Inclan said he would definitely use the center again.

"It's here in Kentucky, very convenient, and very professional," he said. "The fee for the study was nominal and very doable."

Using the sensory lab, analysts can explore product development questions for a wide-range of products, including fresh foods, processed foods, and beverages. The sensory lab underwent renovations in 2011 to make

the facility state-of-the-art, including new lighting, new paint designed not to influence participants' sensory perceptions, air- and light-tight wall panels, and iPads to record participants' responses. The technology upgrades allow center personnel to compile study results in a matter of days and quickly get them in the hands of their clients.

"The sensory lab is an excellent place to have a final test for a product to help you make a good marketing decision," Anandappa said. "The results can help people market their product a particular way, or it may even help them determine whether to move forward with a product."

Not only do the researchers conduct studies, but they perform many other services including educational training with programs like Better Process Control School, Hazard Analysis Critical Control Points (HACCP), and MarketReady. Many times, these programs are taught in conjunction with personnel from county and state health departments and the Kentucky Department of Agriculture.

While clients vary greatly in size, industry, experience, and need, they all dream of creating and marketing a successful product. The UK Food Systems Innovation Center is here to help them line grocery shelves with the best, safest product possible. 🍀



Volunteers take part in a sensory panel, one of the client services the UK Food Systems Innovation Center provides. The red light neutralizes participants' visual perception of the product, so they won't be influenced by the way it looks.

Kentucky is *Apple-icious*

By Carol Lea Spence
Photographs by Stephen Patton

Tart and bright green, little Lodi tantalizes customers from the shelves of Haney's Appledale Farm Market in Nancy. They should call it the Kissing Apple, 'cause the June apple will put a pucker on your lips if you eat it raw. Most people buy it for cooking. It adds zing to a pie. Don't look for it in a grocery, though, only on the farm.



(above) Don Haney examines an apple tree during the spring bloom. He and his brother Mark plant dwarf trees—as do many growers—because they can get up to 300 trees to the acre, they don't have to use a ladder to pick the fruit, and the trees come into production a lot earlier. He said the only downside is dwarf trees don't live as long as full-sized.

(opposite) Matt and Amanda Gajdzik in their Shelby County orchard. "If he can raise it, I'll sell it," Amanda said. Kentucky fruit growers often concentrate on selling their fruit retail through their own on-farm stores, such as Haney's Appledale Farm Market. (opposite)

"That's a niche apple," said Don Haney, '70, who owns Appledale with his brother Mark. "You could never ship that apple, because it's so thin-skinned. You look at it, and it'll bruise."

Let Washington, Oregon, Michigan, and New York, major wholesale shippers of apples, battle over which lays claim to the title Apple Capital of the World. We've got a different business model in Kentucky.

"I don't think anybody would encourage anyone to do wholesale," Haney said. "The market window is too narrow; for Kentucky apples it would be two weeks, three weeks at the most, because once Michigan apples come in, they blow you out of the water."

In Kentucky, most producers are selling their crops retail and filling the niche market. Want to buy that early-season Lodi? A sweet Sansa, a sprightly Liberty, a juicy Pink Lady? Head out to the farm.

The Haney's have about 50 acres in tree fruit production, which include 40 varieties of apples that will ripen between June and October. Of those, you would be unable to buy at least a dozen varieties anywhere else

except an orchard. Which is good, because when sold so close to home, apples can ripen on the tree, rather than in a cooler, developing a rich, full flavor that brings customers to the farms in droves.

Big Potential, Many Challenges

According to the most recent U.S. Department of Agriculture's census, Kentucky has about 1,200 acres in apples, 964 of those with trees of bearing age.

"Fruit is one of the tougher things you can grow. It's a very rewarding crop, but it's not for everybody," said John Strang, UKAg fruit and vegetable specialist. "Once you get into it, the economics are pretty good, but it's six years to break even. That's why we don't have a lot of new people getting into orchards."

Billy and Kathy Reid and their adult children, famous for their hugely popular fall festival, are the fourth and fifth generations working Reid's Orchard, which was established 140 years ago. Don and Mark Haney have been farming their family holdings for more than 40 years, continuing a fruit business begun in the late

1800s. Matt and Amanda Gajdzik, brand new in the business, are the exception that proves the rule.

The Gajdziks planted 12 of their 170 acres in Shelby County in fruit trees, including 2,700 dwarf apple trees in 15 varieties. They call it Mulberry Orchard.

“We wanted something that produces enough income to support a family,” Matt Gajdzik said. “We looked for something with the same kind of income per acre as tobacco.”

It takes a lot of acres of corn and soybeans to support a family. On the other hand, tobacco producers could devote a small part of their farms to the crop and make a good income.

“Same thing with fruit, I feel,” Matt said. “You don’t have to have thousands of acres of it to make a living.”

A Networking Trellis

Dwarf apple trees benefit from a trellis for support; growers need a support network of their own. When Gajdzik, ’04, and his wife Amanda, ’04, were planning their orchard in Shelby County, they sought advice from other orchard owners and UKAg specialists.

“We visited a lot of orchards in the state; all of them opened their doors to us and took us around their orchards,” Matt Gajdzik said. “Everybody grew Red Delicious, Golden Delicious. There were a lot of duplicates, so that’s how we developed our core—you saw what everybody was growing and thought, well, that must be something.”

There are so few growers in the state that most of them don’t compete directly. They gather at events such as the Kentucky Fruit and Vegetable Conference in January and during on-site spring orchard meetings where UKAg specialists work with growers on integrated pest management and other problems.

“A roundtable discussion is a big part of that, where the growers can get their questions answered,” Strang said.

Strang, horticulture specialist Shawn Wright, and Daniel Becker, extension associate for vegetables and fruit, often make farm visits to share information with growers. “Of course we cooperate very closely with Ric Bessin in Entomology and Nicole Ward Gauthier in Plant Pathology who have fruit responsibilities,” Strang said. “It’s a nice group to work with.”

Even if their advice isn’t always taken.

Haney was showing off his orchard when he



stopped and pointed at two rows of Honeycrisps.

“I didn’t listen to Dr. Strang. We were encouraged not to plant Honeycrisps, but I wouldn’t listen to him. I thought, I can do that. I can grow anything. Well, I can’t,” he said, chuckling.

It’s a bit too far south for the northern tier apple—too much heat. “By the time they get ripe, you start to get rot in them,” Haney said.

Live and learn.

Three generations of Reids farm together, with the fourth waiting in the wings. (front) John Reid, Billy and Kathy Reid, Katie holding Bella (back) Brad, Valerie and Mark with Paisley



Apple trees are not grown from seed, but propagated by budding or grafting onto rootstocks, which determine a multitude of properties, from tree size to disease resistance. It can take about 20 years to evaluate a rootstock.

If It Isn’t One Thing, It’s Another

Losing trees. Losing fruit. Loss is part of a fruit producer’s life.

“In 2012, we had a spring freeze that really affected fruit production. In ’07 we lost a crop. In ’86, we lost a crop.” Haney ticked off on his fingers some of the really memorable bad years.

The Gajdziks, in their short time in the business, have already met with nature’s idiosyncrasies. They weathered the severe spring freeze of 2012 without a lot of damage, but before they could relax, a hailstorm dented just about every apple they had.

This past summer was rainier than apples prefer, which was in direct opposition to the summer before when extreme heat shut the trees down. Photosynthesis is responsible for adding sugar to the fruit, but another process affects the sugar, too. Trees breathe.

“The higher the temperature, the faster that respiration process, and the faster they burn the sugars up. So when that temperature gets up to be 90 or 95, that tree’s just holding its own. Nothing’s going on,” Strang said.

Temperature not only affects respiration, sugar production, and fruit color, it is an important factor in insect and weed pressure.

Reid’s Orchard in Daviess County was the first orchard in the state to participate in the College’s integrated pest management research program for apples.

(opposite) “The apples we grow now have been selected from hundreds of thousands of varieties for good qualities.”

— John Strang

Food and Fun

October traffic snaked along U.S. 60 east of downtown Owensboro. Rain threatened, but a little sky water wasn’t going to deter anyone from dropping by the Reid’s Orchard Apple Festival. About 25,000 people would ultimately descend on the Reid family farm over two days to browse their farm store, listen to live music, peruse vendors, partake from food trucks, and, oh yeah, buy an apple or two.



Getting into the orchard business often means getting into agritourism.

“We are a farm, but we’re really an entertainment center,” Billy Reid said.

The family has put a great deal of time and effort into building a popular agritourism destination. It’s just not their wildly popular annual Apple Festival. It’s the “party barn,” a pavilion to house weddings, receptions and corporate events. It’s Reidland Play Area for the kids, complete with a slide called the Apple Slider and a sluice to mine gemstones. And it’s The Apple House, their on-farm market that’s open all year.

The Haney’s aren’t interested in going that big, but they do offer u-pick, school tours, and flakey, hot-out-of-the-fryer, melt-in-your-mouth fruit pies to attract customers.

“It’s all hands on deck here in the fall of the year,” Haney said. “Our children will show up on the weekends; our wives work on the weekends: all the help we can hire, beg, borrow or steal.”

Continued on page 20



At their peak, they can easily serve 1,000 people a day in their market and bakery. And when their crop is starting to run low but they're still getting a lot of traffic, the brothers have been known to put out what Haney calls "those bouncy toy things" to give kids something to do.

It's the same reason the Gajdziks are making plans to add to their playground outside their own on-farm market.

"We'd like to sell as much as we can through the store," Matt Gajdzik said. That means attracting people to the farm with rope and corn mazes, a hay castle, and hay rides. They also host school tours, where every student goes home with an apple and a brochure and, the Gajdziks hope, returns later with parents in tow.

"It makes us more of a destination than just coming to get your groceries," Amanda Gajdzik said. 🌿



Katie Reid displays some of the many products available at her family's on-farm market, The Apple House. As part of a diversified farm, the Reids grow 18 varieties of apples on 22 acres.

"IPM really helped us understand when the disease is going to be there and also when the insect eggs are going to hatch," Reid said. "So instead of spraying every 10 days, we wait until a certain condition happens, and that's when we do it. It's all about timing."

Seeking Perfection

Ask a farmer what they consider to be the perfect apple and you'll get a dozen different ideas. It has to taste good. It has to have a good shape and good color. It's got to store well. It's got to hang on the tree and not drop off. It should have insect and disease resistance. A tree that grows straight up is not as good as one that opens up and lets in sunlight and spray material. Oh, and a tree that doesn't require a lot of pruning would be nice, too.

Ask consumers what they want in an apple. They'd like it to be tart. Or sweet. They want the juice to run down their chins. Or not so much. Some want a softer apple, some want a crisp one. And some want one that won't turn to mush when it's cooked.

There's a lot riding on that simple fruit. There's a lot riding on our growers. 🌿

Research Annual Report 2012

Kentucky Agricultural Experiment Station
College of Agriculture, Food and Environment

The Whole is Greater

Agricultural experiment stations, created as part of the U.S. Department of Agriculture system, use the best science to solve problems, with a view to the practical application down the road. And when experiment station researchers work closely with able-minded partners, it can often spawn new ideas and strengthen their work.

With federal, state, industry, and other universities as partners, UKAg faculty conducted 147 projects and brought in more than \$23 million in external funds in fiscal year 2012. And partnerships don't just come from outside the university. At UK, in a setting typical of the modern land-grant university, College of Agriculture, Food and Environment researchers are part of an integrated program that often includes experts from the research, teaching, or extension fields. Kentuckians can be rightfully proud of this core of dedicated people.

We, in the Kentucky Agricultural Experiment Station, are proud of those of us who work to improve animals, plants, and the lives of humans. You might be familiar with the concept of the "microbiome," the pervasive collection of bacteria that influence virtually all body functions. A USDA research arm, the Agricultural Research Service Forage-Animal Production Unit, has been in the College since 2003. Having ARS-FAPRU scientists Michael Flythe and Isabelle Kagan collaborate with CAFE equine researcher Laurie Lawrence has created a powerful team to study the microbiome in horses. The power of this partnership lies in the fact that each individual comes from a different scientific background, yet they share their unique skills to work on a very important aspect of a horse's health and well-being.

Bacteria are also prominent in the study of insect control.

How nice it would be to harness known enemies of insect pests so they could be targeted specifically rather than to use broad-spectrum chemical insecticides. Jen White received a competitive grant from the USDA National Institute of Food and Agriculture to learn how to control the cowpea aphid by studying its bacteria in relation to one of its predators, a wasp. She used her grant-funded research to educate a graduate student in the analysis of bacteria and wasp DNA. The outcome is both good science and a capable student prepared for a research career.

There's a new area of emphasis for the College—behavioral effects on eating and weight loss. We are proud of Kelly Webber, whose research support includes a new grant from another federal partner, the National Institutes of Health. Kelly has worked hard to establish yet another set of partners, clinical researchers from the UK College of Medicine. Kelly's unique knowledge of eating and dieting behavior provides the clinical researchers with more tools to improve human health.

The researchers featured in this issue represent our entire dedicated faculty as they conduct creative research to serve agriculture and society. They demonstrate the fact that the whole is more than the sum of its parts, or in this case, its partners!

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RESEARCH FUNDING

Gifts & Endowment

\$4,026,401

Federal Capacity

\$5,869,538

State

\$29,748,233

Grants & Contracts

(includes funding secured by teaching and extension faculty)

\$22,105,234

History of Grants & Contracts

2012 \$22,105,234

2011 \$32,312,992

2010 \$34,221,048

2009 \$23,829,306

2008 \$30,972,002

2007 \$31,488,174

Research Annual Report

2012 Kentucky Agricultural Experiment Station
College of Agriculture, Food and Environment

Online Weight Loss



Kelly Webber can often be found where weight management intersects cyberspace. The Dietetics and Human Nutrition assistant professor, whose focus for the last eight years has been on adult weight management, has been conducting studies to improve Internet-based weight programs.

"Internet-based programs improve accessibility, especially for people with low access to health care, however, these online programs historically have not been as effective as face-to-face programs—probably because of the lack of accountability," Webber said.

Healthcare professionals and the media have focused a great deal on the so-called obesity epidemic over the past decade, but Webber said overall projections show the problem is not reversing itself, but will continue to increase. Data does show that in some male populations the rise in obesity numbers is slowing, a trend that can be looked on as slightly encouraging. That does not change the fact, however, that obesity continues to be a major health problem. Kentucky is among 13 states where 30 percent or more of the population is considered obese.

For her studies, Webber created an Internet weight loss program based on the Diabetes Prevention Program created by the National Institutes of Health. The program focused on behavioral weight loss, better eating, more exercise, and self-monitoring. Because online, self-directed programs often need some enhancement

to reach the success rates of face-to-face programs, Webber added motivational components to one study, such as journaling and motivational interviewing. In a separate study, half of the participants received portion-controlled meals in addition to the online program.

"In the motivational study, we found that people who come into the study with external motivation—that is, they felt guilty, their doctor said they had to, or they were trying to lose weight for a class reunion—really benefited from the extra motivational intervention that we gave them," Webber said. "We found that people who came in already internally motivated did well no matter which program they were in. The key really is internal motivation when trying to make long lasting change."

Webber is beginning a new study this fall looking at stress eating. Researchers at the University of California, San Francisco have developed a program that basically "rewires" the brain's response to stress. The theory is if you can successfully rewire the brain, you can keep people from stress eating. She is going to compare the UCSF stress management program to a mindfulness-based weight loss program to see which has a higher success rate in improving weight loss.

— Carol Lea Spence



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2012 Kentucky Agricultural Experiment Station
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Microflora with Macro Impacts

The partnership between the UK College of Agriculture, Food and Environment and the U.S. Department of Agriculture-Agricultural Research Service Forage-Animal Production Research Unit continues to pay dividends. Michael Flythe, a microbiologist, and Isabelle Kagan, a plant physiologist in the unit, are looking at gastrointestinal microflora with UK equine nutritionist Laurie Lawrence from Animal and Food Sciences. The microflora include bacteria in an animal's digestive system that break down high fiber feeds, like grasses.

"People think cows eat grass," said Flythe. "Cows eat bacteria, and the bacteria eat the grass. Similarly, horses can't digest fiber without the bacteria that live in the hindgut."

The hindgut is composed of the cecum and colon of the large intestine.

Flythe, Kagan, and Lawrence study the intersection of plants, animals, and microbes.

"Largely, we are interested in disturbances, things that upset that relationship," said Flythe. "Something that happens in the diet or something that happens to the animal upsets their microflora and causes a variety of problems."

They are also interested in the beneficial things that plants do for the animal's diet, such as whether a horse's performance or health can be improved by supplementing them with something already found in forage, rather than giving them a man-made medicine. Over the next five years, the researchers plan to look at microbes involved in pasture-related laminitis. High levels of carbohydrates present in lush pastures are a risk factor for laminitis, which can cause serious lameness. The researchers want to find out what is going on microbiologically when the horses graze lush pasture and if there is a natural product for intervention.

Equine nutrition and the nutrition of mares and foals is the focus of Lawrence's work. She

said since the ARS unit came on campus in the early 2000s, it provided an opportunity to go in a whole new direction.

"We have been able to do several experiments looking at development in the foal, and we have been able to look at the microbiology of the digestive tract," she said.

The big picture focus of the research is on the factors that affect the microflora of the horse's gastrointestinal tract, such as diet, antibiotics, probiotics, and secondary plant metabolites, which are compounds produced by plants that may affect their susceptibility to insects or disease. Flythe and Kagan bring a new tool set that allows Lawrence's team to look at a part of equine nutrition they weren't previously able to study.

"The best part is, we all have a different perspective," Lawrence said. "We all look at it differently and ask different questions. They can help us find the answers, and I can help frame the right question and give them the right context. It has been a really great collaboration."

— Jeff Franklin



(l-r) Laurie Lawrence, Michael Flythe and Isabelle Kagan

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Deciphering a Bacterial Shield



Matt Barton

Worldwide, the cowpea aphid attacks more than 200 plants and 50 crops. The little pest prefers the taste of legumes, particularly alfalfa. Since the 1990s, cowpea aphid populations have caused enough damage in the United States to warrant insecticidal sprays.

An aphidiid wasp, *Lysiphlebus testaceipes*, helps keep aphid populations under control, but is not effective against the cowpea aphid in alfalfa. Researchers suspect this natural biological control agent may have failed with the cowpea aphid because of the type of bacteria the aphid possesses.

Jennifer White, UK assistant professor of insect ecology, and graduate student Cristina Brady screened 46 cowpea aphid populations from around the world for bacterial symbionts as part of a grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture.

Bacterial symbionts, such as *Hamiltonella* and *Arsenophonus*, live inside aphids and other insects. Insect mothers transfer the symbionts to their offspring. White said it appears that *Hamiltonella* helps the aphids protect themselves from the wasp.

"We found all six of the bacteria we were looking for in some aphid populations," White said. "It became interesting when the type of bacteria a particular aphid possessed depended upon the host plant from which the aphid was collected. *Hamiltonella* was pretty uncommon, but when we did find it, it was virtually always in aphid populations that came from alfalfa, all over the world."

Fortunately, researchers did not find *Hamiltonella* in the aphids they collected

from Kentucky locust trees, which are native to the state but invasive in other parts of the world.

White and Brady conducted a second, localized study. Of the aphids they collected from locust trees, 92 percent were infected with *Arsenophonus*. Of the aphids they collected from alfalfa, 89 percent had *Hamiltonella* and none had *Arsenophonus*.

"Sometimes we collected locust aphids from trees right next to alfalfa fields with their own aphids," she said. "Even though they look like the same aphid, their biological properties are very different and their ecology—how they're going to interact with the other members of the community—is very different."

She added that while these aphids can both eat some of the same plants, the ones feeding on locust trees didn't do well on alfalfa, and the ones on alfalfa didn't perform as well on locust.

White and Brady took their research a step further by using DNA analysis to study the success rate of the parasitoid wasp.

"We found more of the wasp's DNA in the aphids coming from the locust trees than in the ones coming from alfalfa," she said.

White's research will continue with the goal of determining what causes certain bacteria to appear in some aphids but not in others and to understand the interaction between the symbionts and the host plants.

"This basic research will help scientists understand the basic biology of pest organisms, make the best biological control decisions possible and be aware of possible pitfalls certain biological control measures could have," White said.

— Aimee Nielson



Matt Barton

WE GROW...

warriors for Kentucky

Forest Entomology Professor
Lynne Rieske-Kinney is a fighter. She and her research team battle forest invaders, studying how invasive species impact forest ecosystems and devising winning strategies to overcome them. It's vital work because forest health affects us all.

"We're beginning to see the fruits of our labors," she said. "I have much more hope for these threatened species than I might have had 10 or 20 years ago."

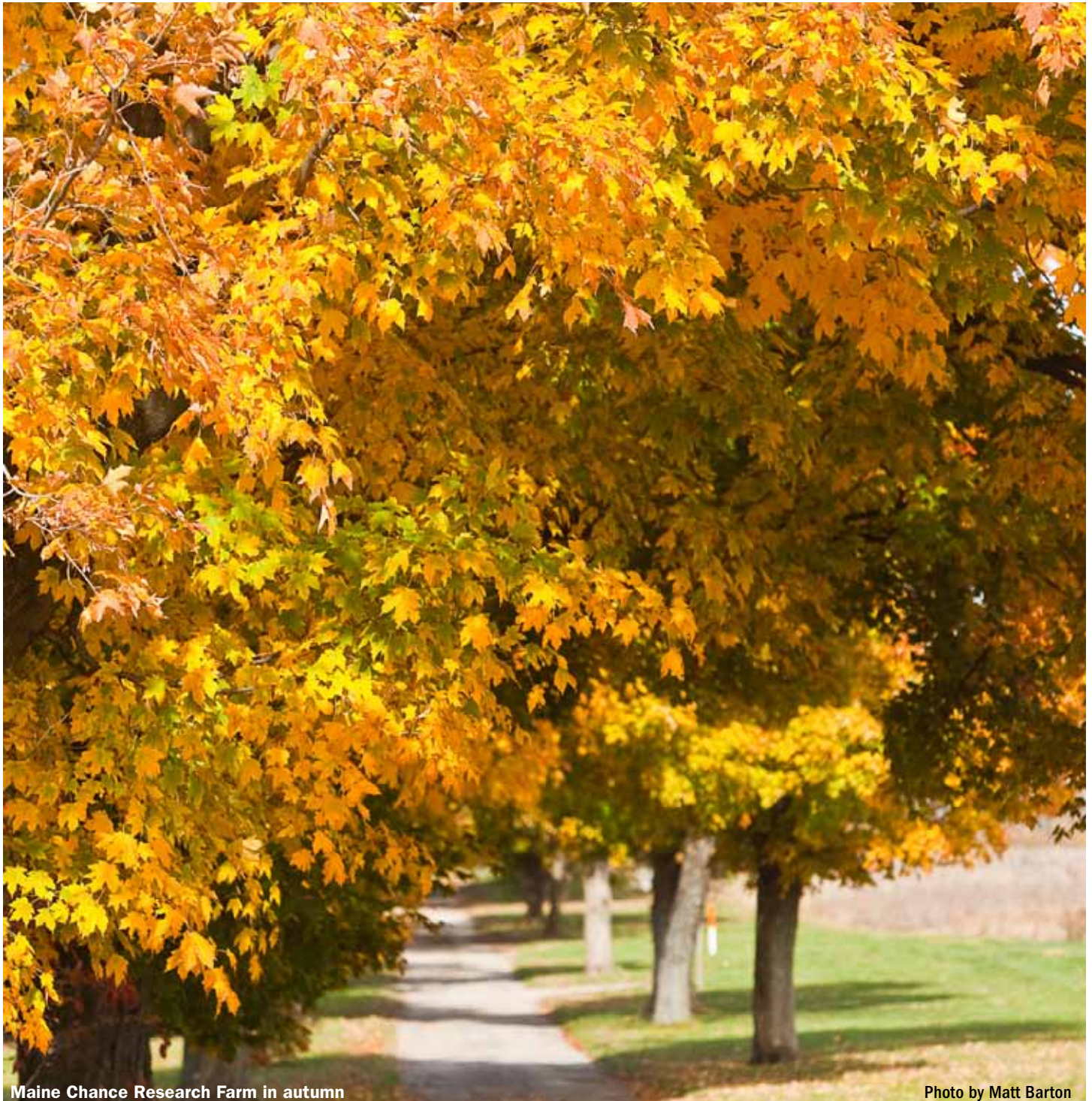
Lynne Rieske-Kinney, one of the many faculty, staff, and students from the College of Agriculture, Food and Environment who are dedicated to fighting the good fight for the commonwealth and beyond.

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Change Service Requested



Maine Chance Research Farm in autumn

Photo by Matt Barton