GROWING AG ECONOMIES TO FEED A HUNGRY WORLD
Agriculture holds the solution to many global problems

Food is an essential of life, whether in rural Indiana or rural Africa. As world population continues to grow, scientists must develop cropping systems that increase production for modern, domestic farms and also help subsistence farmers take more crop to market.

This Agricultures issue features Purdue Agriculture discovery, learning and engagement programs that improve food security, increase farm income, and teach modern crop and livestock science at home and abroad.

• Two large-scale international efforts, funded by the Gates Foundation and U.S. AID respectively, include PICS, a storage-bag system that helps African farmers secure grain for post-harvest sale, and programs to rebuild war-torn Afghanistan's agricultural economy.
• At Purdue, there's renewed emphasis on recruiting plant sciences students to meet growing industry demand. A new plant sciences coordinator will deliver informative programs to teachers and pre-college students.
• A national consumer trend for locally grown food is creating new opportunities for Indiana's small farms. Purdue Extension is helping communities develop new distribution systems, such as food hubs, that expand access to markets and improve the rural economy.

Looking to the future, some of the most pressing issues facing society revolve around feeding a growing population. Helping impoverished nations improve their agriculture and food systems is more than humanitarian aid. A strong agricultural economy helps lift people out of poverty, increases global stability, and secures agriculture and food systems around the world. Helping nations obtain a more plentiful, nutritious food supply increases farmers' incomes and contributes to our global economy.

Jay Akridge
Glenn W. Sample Dean of Agriculture

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Glenn W. Sample Dean of Agriculture

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Henderson at the helm

Jason Henderson, a Federal Reserve Bank of Kansas City vice president who leads the Bank’s agricultural and rural outreach and research programs, has been appointed associate dean of Purdue Agriculture and director of Purdue Extension.

Henderson, who earned his master’s and doctoral degrees in agricultural economics from Purdue, will begin his new role May 28.

“Purdue has one of the strongest Extension programs in the country, and we were looking for a leader who could build on our momentum and strong state support,” said Jay Akridge, Glenn W. Sample Dean of Purdue Agriculture. “We found that person in Jason Henderson.”

Henderson, who joined the Bank in 2001, has been Omaha Branch executive of the Federal Reserve of Kansas City since 2006 and vice president of the Kansas City Fed since 2007. He is responsible for outreach programs in the state of Nebraska for the Kansas City Fed. In this role, he engages a broad group of stakeholders who include business leaders, elected officials, and agricultural and youth audiences.

Henderson said Purdue Extension is uniquely positioned to help leaders and provide the technical knowledge and insights they need to build a vibrant agricultural sector and healthy rural and urban communities. “Growing up on a dairy farm during the 1980s, I learned that healthy rural communities are those that provide economic opportunities both at the farm gate and on Main Street,” he said.

“Purdue has an exceptional team of on-campus specialists and county educators, and I am very excited about working with this group to make an even bigger difference for the people of Indiana.”

Ag historian lends expertise to The Dust Bowl

R. Douglas Hurt, professor and head of the Purdue University Department of History, was a program advisor for the Ken Burns documentary The Dust Bowl, which premiered on PBS last fall.

Hurt, who specializes in American agricultural history and is author of The Dust Bowl: An Agricultural and Social History, was interviewed about the causes and consequences of the Dust Bowl in the 1930s, which ruined farmland and left many people destitute. Hurt also discussed how people in the region and the federal government responded to the drought and the worst wind-erosion problem in American history.

“The Dust Bowl and drought of the 1930s attracted a great deal of attention during this past summer’s drought,” Hurt said. “People often ask if the Dust Bowl could happen again. Drought is a natural phenomenon of the Great Plains. It will come again, but we have a better understanding of wind erosion and the methods and technologies, as well as precedent for government support, to prevent its worst effects on agriculture.”

Hurt is also the author of several other books on American agriculture.

Chicago’s strategy for controlling carp won’t work in Midwest’s rivers

One of the more promising ideas for controlling or eliminating troublesome Asian carp populations in the Midwest’s rivers is impractical and unsafe, according to a Purdue University researcher.

Scientists had hoped to modify or expand low-voltage electrical barriers like those used around Chicago waterways to direct fish from particular areas. Reuben Goforth, an aquatic ecology researcher, said the level of electricity needed to kill Asian carp eggs would be far too high.

Asian carp are not native to U.S. waterways but have been found in rivers throughout the Midwest. They compete with native species for food and alter ecosystems. They’re also dangerous to boaters and other river users.

“Imagine going 35 mph in a boat and having something with the mass of a bowling ball hitting you in the face,” Goforth said. “There are cases of broken cheeks, broken noses, people being knocked out.”

In tests, Goforth found it took at least 16 volts per centimeter of electricity to kill the embryos. That’s in contrast to 1 volt per centimeter used in electrical barriers around Chicago. “Using 16 volts is just too much,” he said. “It would be dangerous for people and other aquatic life to put that much electricity in the water.”

Goforth will look at other methods to control Asian carp, including using weak electrical fields or hydroacoustics to deter the fish from optimal spawning grounds.

Indiana part of childhood obesity study

Two Indiana counties—Adams and Henry—have been selected for studies that examine causes of child obesity in rural, low-income communities.

Communities Preventing Childhood Obesity will help community health coalitions identify and correct problems that contribute to child obesity, such as lack of playgrounds or healthy food. The project, led by Kansas State University and funded by the U.S. Department of Agriculture, includes Purdue Extension. Two counties each from seven states are selected for studies that examine causes of child obesity in rural, low-income communities.

Each county’s coalition will determine needed improvements and implement programs to address them. Evaluations at the end of the study in 2016 will assess the programs’ effectiveness.

“Obesity is a national concern and, as such, is a high priority for Purdue Extension and health organizations around the world,” said Angie Abbott, assistant director for Purdue Extension in the College of Health and Human Sciences. “There are tremendous needs in our Indiana communities that we hope to meet through the results of this study.”
**Weaver receives Spirit of Land-Grant Mission Award**

Nutrition scientist and professor Connie Weaver received Purdue University’s 2012 Spirit of the Land-Grant Mission Award for improving nutrition recommendations for children, adolescents and adults nationwide through her research in calcium absorption and bone health.

The award is presented annually to a Purdue faculty member in the colleges of Agriculture, Health and Human Sciences, or Veterinary Medicine whose work exemplifies the land-grant mission of discovery, engagement and learning.

Much of Weaver’s work with children and adolescents takes place at Camp Calcium, a six-week camp designed to measure calcium absorption and use in children and younger teenagers. The camp, held annually for the last 22 years, gives adolescents a chance to explore careers and take science and math classes in a college environment while researchers control their diets and measure the amount of calcium their bodies absorb.

“The award reflects excellence in discovery, engagement and learning, and Connie demonstrates this excellence in a way that very few have,” said Karen Plaut, director of agricultural research and associate dean of Purdue Agriculture. “Connie embodies the spirit of the whole award, particularly in the area of engagement. She truly has an attitude of ‘let’s take that research out and get it to the public.’”

Jessica Merzdorf

**Farkas to lead Food Science**

Brian E. Farkas, professor of food science at North Carolina State University since 1994, has been appointed professor and head of Purdue University’s Department of Food Science. The appointment is effective July 1.

Farkas succeeds Suzanne Nielsen, who is returning to the College of Agriculture faculty after serving 10 years as department head. “Brian is a proven leader, and I am excited about the vision, passion and energy he will bring to the food science department,” said Jay Akrigde, Glenn W. Sample Dean of Purdue Agriculture.

Farkas said he is honored to be following in the footsteps of the department’s first two leaders—Nielsen, and, before her, Philip E. Nelson. He said the department’s faculty and staff, and the Purdue Agriculture administration are leaders in their field. “Their reputation for excellence in the land-grant mission is widely known, from developing students as scientists and professionals to addressing critical issues of global interest and facilitating Indiana’s economic growth,” he said.

Farkas has been alumni distinguished undergraduate professor and undergraduate coordinator of food science at North Carolina State since 2009. He began his work at the university as an assistant professor in the Department of Food, Bioprocessing and Nutrition Sciences and rose to professor and associate department head in 2006 before taking on his current duties.

Keith Robinson

**Grilled, seared foods may add to waistlines**

A steak slapped onto a hot barbecue will leave the meat with black grill lines that add flavor and aroma, but the chemicals contained in charred, seared and fried foods may over time kick-start the body’s ability to add new fat cells and increase the risk of age-related diseases.

Over time, the human body shuts down the ability of young fat cells to mature and accumulate lipids. But grilling, searing and frying create glycated proteins, which result from proteins chemically bonding with sugar.

“When you put proteins and sugars together at high temperatures, there is a chemical reaction, and that creates flavor and texture, which we think of as good things,” said Kee-Hong Kim, a food scientist at Purdue University. “But research suggests that these glycated proteins are involved in age-related diseases like cardiovascular disease.”

Kim wanted to see whether glycated proteins affect the speed at which precursor, or immature, fat cells turn into mature fat cells. Using a cell culture, Kim saw no change in how quickly those immature cells accumulated lipids, which are stored as fat in cells, but he did notice something else.

“Older animals don’t generally accumulate new fat cells. Those precursor cells lose their ability to become mature as we age,” Kim said. “But when exposed to glycated proteins, immature fat cells started to accumulate lipids like they would in a younger animal. When we continuously consume glycated proteins, we might turn on the ability of precursor cells to mature,” he said.

Kim found that the byproducts of glycated proteins interfere with cellular processes that should kill immature fat cells in older animals. That means those animals, or people, may accumulate more fat cells than they should, and those cells store compounds that can lead to inflammation and certain types of diseases.

“It’s really interesting that a single food component could contribute to a number of diseases,” said Chih-Yu Chen, a doctoral student in Kim’s laboratory. Kim is investigating the relationship between obesity and a number of chronic illnesses such as diabetes, cardiovascular disease and some types of cancer. He believes glycated proteins may be a factor in some of those diseases.

Brian Wallheimer
Teens Take Part in National Program to Learn and Teach Biotechnology

By Nancy Alexander

Afterschool program at New Community School in Lafayette, Ind., a dozen fifth- and sixth-graders energetically shake plastic bags of soymilk and sugar encased in outer plastic bags of salt. They’re making ice cream while their teachers explain how the cells change as the liquid becomes a solid.

Teen Teachers

These schoolchildren are learning science, but their teachers aren’t degree adults: They’re high school students—Teens Teaching Youth Agriscience/Biotechnology—who are learning right along with their pupils.

All are participants in a 4-H program piloted last year in two Indiana counties and expanding across the state. The national pilot program, jointly funded by the National 4-H Council and the United Soybean Board, involved five land-grant universities, including Purdue. Renee McKee, program leader for 4-H and Youth Development, was instrumental in forming the teen teaching team and helping secure funding from the National 4-H Council.

Indiana program coordinator Stephanie Femrite, 4-H youth development educator for Purdue Extension in Tippecanoe County, and her Extension counterpart in Bartholomew County, Erika Bonnett, initially recruited two teenagers in each of their counties. “I was looking for youth who were self-starters, had leadership capabilities, were creative and who had science background and interest;” Bonnett says.

And she knew Josh Gray, a 4-H Junior Leader and Boy Scout who aspires to a career in engineering, “would be the perfect fit,” she says. When she texted Josh that she had “this amazing science opportunity for you to learn and teach… Are you interested?” he jumped in. “I honestly thought it was a service project, like in 4-H,” Little did he know!

Gray and Joey Perry in Bartholomew County, and Grace Baldwin and Kristin Dill in Tippecanoe County, were also among 16 “teen leaders” from five states who attended a four-day national training event in January 2012 in Indianapolis. They were introduced to the agriscience/biotechnology curriculum, toured local industry and practiced their hands-on teaching activities. In April they staffed the 4-H booth at the USA Science and Engineering Festival in Washington, D.C. And in Indiana, they trained 14 more teens from the two counties and as teams, facilitated biotechnology education in 4-H clubs, camps, afterschool and school programs and helped to implement the program statewide.

The original four teens helped train 47 others representing 10 more Indiana counties in November 2012. Those teen teachers have returned to their counties to lead classes for upper-elementary and younger middle-school students.

Baldwin, now a first-year agricultural engineering major at Purdue, and her fellow teen teachers were challenged to figure out ways to teach science and biotechnology that kept the younger students engaged. “I learned so much more about agriculture than I ever expected;” says Baldwin, a 10-year 4-H member and Junior Leader. “It was great to see 4-H taking a different approach.”

Focus on Fundamentals

Kathryn Orvis, associate professor in youth development and agricultural education and horticulture and landscape architecture, applied her expertise in plant science and biotechnology to design the curriculum. “One of the main things I try to emphasize is that it’s important to learn the fundamental, underlying concepts that form the basis for some of the technology we use,” she says.

The curriculum is flexible, so different teams can adapt it to different settings. “We gave the teens a toolbox of activities,” Orvis explains. “Then they could change it up. We wanted them to have the ownership, to be empowered with the leadership and teaching experience.”

“The teenagers really took full charge,” says Femrite, who has since taken a position with University of Missouri Extension. “I continue to be impressed and amazed by their ability. When teenagers are teaching younger students, they serve as role models.”

The program targets a new audience for 4-H—youth who do not necessarily have agricultural backgrounds and may not be 4-H members. According to Orvis, it also reflects the national organization’s commitment to STEM (science, technology, engineering and math) education.

For the teen teachers, it’s about sharing new information in creative ways. “Being hands-on is something fifth- and sixth-graders like,” Gray says. “When we tell kids about proteins, and then molecules and so forth, progressing into DNA extraction and encoding, we see the excitement these kids have for science… To me, that is amazing.”

Contact Nancy Alexander at agricultures.magazine@purdue.edu
Food Trend Boosts Ag Economy

Consumers’ Interest in Buying Local Expands Specialty Markets

By Brian Wallheimer

It’s not enough for people these days to know the country in which their food was grown. A Washington apple, Georgia peach or Florida orange may not even impress savvy consumers. They’re interested in knowing exactly where their food comes from—sometimes down to the particular farm.

In recent years, the popularity of books and documentaries espousing the virtues of organic and locally grown foods has vaulted them to the forefront of consumers’ minds. And the spate of illnesses that have popped up across the country linked to Salmonella, E. coli and other bacteria, says Purdue University agricultural economist Maria Marshall, give people a strong desire to know more about where their food is coming from.

“This kind of started as a push for organic foods, and now we’re seeing that people want more than that. They want to know where their food comes from, and buying local is a way to do that,” Marshall says.

Nathan Fingerle, owner of RiverRidge Farm in Wabash County, Ind., says one of the top questions his customers ask is about how his produce is raised. They want to know about pesticides, herbicides and genetics. His advantage is that it’s a short walk from his on-site farm stand to his fields and greenhouses. “If you want to see, come out to the farm and see how we do it,” Fingerle says. “I’m happy to show you.”

Fingerle sells produce year-round at his farm stand and during the summer at the Wabash City Farmers Market. He also sells in-season produce to the Manchester Community Schools.

The demand isn’t slowing, even in a down economy. And Fingerle says he doesn’t expect it to slow, especially once people see how long fresh produce lasts and how good it tastes.

“It seems like we won’t have a week go by without getting a new customer,” Fingerle says.

Jennifer Dennis, a Purdue agricultural economist and associate professor of horticulture, says people searching for local foods are interested in boosting their local economies and meeting the producers who grow their food. But health seems to be the overriding reason they look for locally sourced foods.

“People are trying to simplify their lives, and one way to do that is to have a little more control over health. Choosing local foods at a farmers market is something people see as a way to make better choices and exert some of that control,” Dennis says.

People searching for local foods are interested in boosting their local economies and meeting the producers who grow their food. But health seems to be the main reason they look for locally grown foods.
Farmers Markets: Just the Beginning

For years, farmers markets have been the standard for finding locally produced foods.

“In farmers markets, there has been unprecedented growth for the last 15 to 20 years,” Dennis says. According to the U.S. Department of Agriculture, there were 1,735 farmers markets in the United States in 1994. Today, there are more than 7,800, with 164 of them in Indiana.

Marshall, who is program manager for the Food Entrepreneurship Engagement Grant Program, says he’s seen the most growth from artisanal products—things like spices, jams and jellies, and dog food. A big part of that is because people can sell directly in the community at farmers markets, and the successful products can find homes in stores that cater to natural or artisanal items.

“You have a lot more places like Whole Foods and Trader Joe’s and restaurants that want these things. Then, there are internet sales,” Marshall says.

Dennis says another factor in the growth is a new Indiana law, passed in 2009, that allows home processing of produce.

“That has been prohibited, but now it allows people to make and sell their products at places like farmers markets,” Dennis says. “Farmers markets are now as diverse as the communities they’re in, or as diverse as the local boards governing the farmers markets let them be.”

Bringing It Home

But at heart, people are still busy and thrive on convenience, and once-a-week markets open a few hours can’t and thrive on convenience, and once-week markets let them be. “You have a lot more places like Whole Foods and Trader Joe’s and restaurants that want these things. Then, there are internet sales,” Marshall says.

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Community-supported agriculture programs have helped fill the void for some. Those programs allow consumers to sign up with a farm for a share of a year’s harvest, with their portion delivered to their home or available to be picked up.

The drawback, some say, is that the buyers get only what’s in season at the time—sometimes leaving them with items they don’t want or they’ve never heard of.

That’s spawnd food hubs, a sort of hybrid of CSAs and farmers markets.

The idea is that consumers can see, sometimes online, what participating farms have to offer each week and order what they want. The farmers drop off what’s been ordered to a central location where it’s divvied up, and the buyers pick up their produce each week.

“Consumers really want convenience, and they’re not going to drive all over the country to source some of their food. Some consumers do not find farmers markets convenient due to limited hours and locations. With already busy schedules they may be unwilling or simply unable to take the time to attend a traditional farmers market venue to buy a portion of their family’s food,” says Roy Ballard, a Purdue Extension educator in Hancock County who chairs a committee setting up a food hub for central Indiana this spring. “Food hubs are a way for farmers to reach markets together that they couldn’t have reached individually.”

Dennis says food hubs are bright spots in the local food movement’s future, especially for growers.

“The small farmer, by definition, has a problem with transportation and logistics. Hubs give them better access and a better point of distribution,” Dennis says. “Those small farms that are innovative and efficient, that look at farmers markets, food hubs and cooperatives, will do well.”

Hubs could also help restaurants purchase more local foods. A 2013 National Restaurant Association survey of restaurant chefs asked for the hottest trends in food for 2013. The top two answers—mentioned by more than 80 percent of the chefs—were locally produced meats and seafood, and produce.

Megan Hutchison says she’s seen an increase in interest from restaurants in the Bloomington area for local foods. Hutchison manages the Local Growners Guild, a cooperative of farmers, retailers and community members dedicated to supporting the area’s local food economy.

But restaurants have a hard time getting those local foods.

“There’s another tier of restaurants that would like to buy locally if it was convenient for them,” Hutchison says. “That’s where I see food hubs really helping.”

Cutting the Confusion

One pitfall consumers should avoid, however, is confusing organic and local foods.

“They’re not mutually exclusive, but they’re not necessarily the same thing either,” Maria Marshall says. Even small farms might use pesticides and herbicides. If consumers want to be sure that products are organic they should look for the USDA organic label.

“Some local growers may use organic techniques or call their food natural, but the only way to know if it’s organic is to ask,” Marshall says.

Still, the demand for organic and local food is growing, and the Purdue experts don’t see that subsiding anytime soon.

“We’re still in the growth stage. We’re not mature yet,” Dennis says. “People are really trying to take charge of what they’re eating. Most of the foods sold at farmers markets, CSAs and food hubs will be a part of that because by their very nature—as mostly fruits and vegetables—they’re what people are looking for.”

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A Hand Up

Humanitarian Work Abroad Hits Home

For Bill Gates, the bag he lifted up before the audience as he began his presentation was both a prop and a symbol of the hope that his philanthropic foundation and Purdue Agriculture research are giving to people in poverty half a world away.

Speaking in June in Washington, D.C., during a convocation of the Association of Public and Land-Grant Universities, Gates held the bag to his side while he explained its significance. The three-layered, polyethylene- and polypropylene bag he noted, costs less than $2 but is increasing income of farmers in Central and West Africa by 25 percent.

“This bag is actually helping lift 10 million people out of poverty,” he told his audience, which was commemorating the 150th anniversary of the Morrill Act of 1862, the law that allowed for creation of all land-grant universities such as Purdue.

The front of the bag read “PICS,” an acronym for Purdue Improved Cowpea Storage. The PICS project, started in 2007 and funded by $12 million from the Bill & Melinda Gates Foundation, is one of many initiatives under Purdue’s International Programs in Agriculture.
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The hermetic PICS bag is enabling farmers in Africa to protect the protein-rich, staple cowpea—in America, it’s called the black-eyed pea—from a destructive weevil that infests the crop and otherwise damages much of it in post-harvest storage.

PICS Improves Economy

Before PICS came along, most sub-Saharan farmers had to sell all of their unprotected crop immediately after harvest, when the price is lowest, or treat it with sometimes dangerous insecticides for storage and sale later. But with the cowpeas now safely stored in the bags for long periods, farmers can sell their crop at various times of the year when market conditions are better for them and, in so doing, provide a nutritious source of food for millions of people year-round.

Not only are the PICS bags helping farmers in Africa to grow economically, the science behind them helps in the education of Purdue Agriculture students. Researchers originally thought the weevils die in the bags from suffocation. But with the cowpeas now safely stored in the bags for long periods, farmers can sell their crop at various times of the year when market conditions are better for them and, in so doing, provide a nutritious source of food for millions of people year-round.

With the PICS technology proving successful in protecting cowpea, Purdue researchers are now trying to determine if it will work with other African crops such as maize (corn) and pigeon pea, a legume. The PICS team also is entering a new phase of raising awareness of the bags in African countries where they are available and of developing a supply chain for their distribution.

Plants Help AIDS Patients

Horticulture professor Steve Weller embraces Purdue Agriculture’s commitment to humanitarian work. He is part of a team that includes faculty from the Departments of Agricultural Economics, Entomology and Food Science helping farmers in western Kenya—an AIDS hotspot—grow native leafy vegetables high in nutritional value. Vendors sell the fresh vegetables at village markets, including this one (right) in Eldoret, Kenya.

The program is funded by the U.S. Agency for International Development and includes research partners at Rutgers University and three educational and research institutions in Kenya. Originally a one-year program, USAID has expanded it for three years to cover “seed to consumption” research focused on building on the capacity of farmers in Kenya and two other nearby countries—Tanzania and Zambia—to provide healthy food for their people and a secure income for themselves.

 recursively

“With the PICS project having led to a new understanding of science that helps our students better understand insects,” Murdock says.

“People from Indiana are helpful and generous,” Murdock says. “We have the pleasure of knowing we’re helping others. And Africa is an emerging market, much like China was 20 years ago. We’re out there on the frontier. By making friends there, we will be in a better position to be trading partners. In helping others, we help ourselves.”

The project was started by the Indiana University School of Medicine, which found that many of the AIDS and HIV patients in Kenya were not responding well to medicines. IU also found that many were farmers, so it enlisted the help of Purdue Agriculture.

Global Partnerships

“We wanted Purdue involved to help farmers produce crops that will provide income security and a healthy diet,” Weller says. “So not only are we providing good crops for their nutrition, but we are helping these farmers to be sustainable for the long haul.”

International Programs in Agriculture’s collaborations with educational institutions, government agencies and other organizations are designed to help improve agriculture, natural resources and food systems in Indiana, regionally and around the world. Partnerships with China Agriculture University and Northwest Agriculture and Forestry University in China, for example, enable Purdue researchers to collaborate with researchers there in areas important to Indiana agriculture, such as corn, soybeans, pigs and ducks. And because China has some agricultural problems similar to Indiana’s—drought, high temperatures, toxins in grain storage—a research partnership there benefits Indiana, says Kashchandra Raghothama, associate director of IPIA.

“With new crops, we have a lot of interest in getting involved,” Murdock says. “They wanted Purdue involved to help farmers produce crops that will provide income security and a healthy diet,” Weller says. “So not only are we providing good crops for their nutrition, but we are helping these farmers to be sustainable for the long haul.”

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“We have common areas of interest, so it makes perfect sense for us to work with them,” he says.

The Farmer to Farmer program allows Purdue Extension educators to travel abroad not only to share their knowledge with farmers who need help but also to return home with perspective-changing knowledge they can use in their home communities. The program, funded by USAID, has connected Purdue Extension educators with farmers in Costa Rica to help improve production, processing and marketing of agricultural products.

“The gain for Indiana is professional development,” says Jess Lowenberg-DelBoer, associate dean of Purdue Agriculture.

Continued on page 17
Joint course with Colombian universities lays groundwork for new collaborations

By Beth Forbes

International partnerships often are considered efforts that build resources overseas. However, international collaborations also enrich Purdue University programs.

Purdue is exploring opportunities with universities in Colombia that would be of mutual benefit. Colombia, probably best known for coffee production, has some of the largest untapped agricultural land resources available. Despite its mountainous Andean terrain, agriculture is one of the country’s most important industries, and the nation is investing in it. Possible ventures include joint research projects in areas such as organic production, insect and disease control, and biotechnology.

“The researchers and facilities there are very good, and the students are exceptionally well prepared,” says Jeff Stuart, Purdue entomology professor. Stuart was part of a Purdue delegation that traveled to Colombia last fall to investigate potential collaborations. They found many possibilities, including some that would strengthen existing Purdue programs.

One association that will provide immediate value is a course offered this summer. Purdue’s Adriela Fernandez, assistant director in International Programs in Agriculture and Latin America coordinator, will teach a joint course with instructors at the Technological University of Pereira and the University of Caldas.

The class is designed to help students get over the fear of learning in another language. “Employers tell us that they want to hire students who not only have technical and subject-based knowledge, but also multicultural competence and foreign language skills,” Fernandez says.

Purdue and Colombian students taking the same ag economics class in food security and sustainable development will learn in Spanish from Fernandez and in English from the Colombian professors. Students at all three institutions will collaborate over the Internet but also have the opportunity to interact in person, traveling one week each in both countries.

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Ag Key to Stability in Afghanistan

One of IPIA’s most visible programs involves its work in helping war-torn Afghanistan build a strong agricultural economy. Efforts supported by $39 million in grants from USAID since 2006 have focused on redeveloping the country’s agricultural colleges in Kabul, Balkh, Herat and Nangarhar, strengthening Afghans’ ability to teach agriculture to their students.

Purdue’s work in Afghanistan is now shifting from that country’s Ministry of Education to the Ministry of Agriculture, the equivalent of the U.S. Department of Agriculture.

Purdue is helping staff to strengthen managerial and technical skills they need to work in leadership roles in the Ministry of Agriculture so they can continue building their country’s economy.

Purdue has USDA support to work in three critical areas—improving the capability to provide Extension services; food, animal and plant health and safety; and agricultural statistics.

These programs will continue through 2014.

“For there to be stability in Afghanistan, there needs to be more economic growth and opportunity,” says Kevin McNamara, an agricultural economist who heads Purdue Agriculture’s work there. “We can teach technologies to Afghans so they can better understand agricultural science and apply it to their needs. We are giving them the technical skills they need to teach their farmers.”

Part of that effort will involve introducing PICS technology to enable Afghan farmers to store their crops in hermetic bags. Farmers now store their grain using more traditional methods, which includes burying it in holes, sometimes under the wooden floors of their houses, and covering it with mud to provide a dry surface that protects the crop against insects. But the system is cumbersome and inefficient.

Lowenberg-DeBoer notes that the future of Indiana and the nation itself depends on Americans living, working and trading with the rest of the world in what has become a global economy.

Purdue Agriculture recognizes and embraces that understanding through IPIA.

“Purdue Agriculture contributes to preparation for that future by helping students understand and experience other countries and cultures;” he says. “We develop research collaborations for mutual benefit and strengthen the capacity of Extension to link Indiana to the world.”

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Gary Neal can “make it rain” anytime he wants. The Clinton County, Ind., farmer doesn’t know a special dance that brings precipitation, nor does he seed the clouds above his cornfield. When Neal needs water for his crop, he flips a switch on his center pivot irrigation system.

This past summer when Mother Nature turned off her spigot, Neal turned his on.

“It was so dry that there were times I had the irrigation system take a couple of laps around the field,” says Neal, who grew 125 acres of irrigated corn on his farm west of Frankfort this past year. “It takes about 14 hours for the system to make one revolution. By the second lap the soil looked like it had received water. Some weeks I put a couple of inches of water on the field.”

Like Neal, farmers across the Midwest are taking a serious look at irrigation following a 2012 drought that was the worst in half a century. The arid conditions left Indiana an average of 3.1 degrees warmer and 6.27 inches of precipitation drier than normal for the year. Southwest Indiana was hit hardest, receiving 9.84 inches of precipitation less than in an average year.

**Water, Water Resources Everywhere**

To help farmers learn about irrigation and whether the systems are right for their operations, Purdue Extension is stepping up its educational programming. Workshops on irrigation systems, water management and rights issues, and the economics of irrigation took place in Fountain, Knox and Tippecanoe counties in January and February. County Extension educators statewide also are providing irrigation publications and referrals to farmers who ask. And asking they are, says Lyndon Kelley, Extension irrigation specialist for Purdue and Michigan State University.

“A lot more people are talking about it, and not just because of last year’s drought,” Kelley says. “We’re looking at a fourth straight year of farmer profits, and the farmers who irrigated last year made money. Those who have been irrigating for years and allowing for the raising of higher-value specialty crops. It is not inconceivable that a farmer could increase crop revenues by hundreds of dollars per acre by irrigating.

**Crop Circles**

Irrigation in the Corn Belt, whether of the overhead pivot or ground-level drop varieties, is more common in states west and south of Missouri, where rainfall is less plentiful than the usually precipitation-rich Great Lakes states. According to the U.S. Department of Agriculture’s 2007 Census of Agriculture, Nebraska irrigated 8.55 million acres of cropland; Indiana that same year, just 397,113 acres.

Corn is the most irrigated crop in Indiana, with soybeans and specialty crops such as melons right behind.

More than 90 percent of Indiana irrigation is center pivot, where long sections of pipes with spray nozzles are suspended about 12 feet above the cropland on wheeled bases and pulled in a giant circle by a stationary motor. Water is pumped into the pipes from wells, some of which reach depths of near 100 feet.

Irrigation systems don’t come cheap. Parts, installation, well work and providing a power supply for the pump to irrigate 132 acres can cost about $120,000. Add a cornfield system to cover more acres, and the total can reach $160,000, says Gene Matzat, Purdue Extension educator in LaPorte County. LaPorte is Indiana’s No. 2 irrigation county.

“I’ve talked to irrigation dealers, and they’ve got installation work backed up to August,” Clingerman says. Clinton County’s Neal won’t have to wait for the installers—just another long dry spell to activate his center pivot.

“I helped my dad and brother put our system in back around 1975 or ’76,” Neal says. “Dad had the foresight to do this when not many people were doing it in central Indiana.”

**Pricey Precipitation**

Water availability is critical, Kelley says. “On hot days you’ll need to be able to pump five gallons a minute 24 hours a day, seven days a week for one acre of land,” he says. “That means for a 100-acre field you’ll need a 500-gallon-a-minute pump. That would be the same as applying an inch of water every four days.”

The water applied to crops also replenishes water sources just below the soil surface. “It is very common for recharge to the aquifers below them. Often the recharge is 150-200 percent of irrigation water use,” Kelley says. Indiana law protects residential water sources and lake levels near irrigated land.

**WEB EXTRA**

Visit ag.purdue.edu/agricultures for answers to irrigation FAQ.

The acreage numbers are certain to go up this year, says Valerie Clingerman, Extension educator in Knox County, Indiana’s No. 2 irrigation county.

The New Crop Insurance?

**After Devastating Drought, More Producers Contemplating Irrigation**

By Steve Leer

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In high school, Daniel Sweeney was like a lot of today’s high school students, not quite sure what they wanted to do for a career. Going to college was a given, but his major was still up in the air. Sweeney enjoyed the natural sciences and took advanced placement science courses, so biology was an obvious contender. What he didn’t know was that the major he now calls the “perfect choice for me”—plant breeding and genetics—was even an option.

Purdue University was at the top of Sweeney’s list for its strong science programs, and he finally narrowed his selection to biochemistry. “I was confident in my choice,” Sweeney says of the decision made his senior year at Cardinal Ritter High School in Indianapolis. But a few months later, he was attending a College of Agriculture visit day “when someone mentioned plant breeding to me.” Intrigued, he looked into the program and found it dovetailed with his interest in plant science, and the opportunity to help solve a global food problem appealed to his desire to serve others.

Raising awareness of the plant sciences with students like Sweeney is key to meeting a burgeoning demand. Nationwide, the agriscience industry is joining forces with colleges of agriculture to find the next generation of plant scientists. Their message to teachers, guidance counselors, students and parents is that careers in plant sciences pay dividends—plentiful jobs, competitive salaries, opportunities for advancement and a role in solving global problems.

Recruiting STEM Students
Not many career fields today can nearly guarantee 100 percent placement and the bonus of picking and choosing from more than one job offer, but many plant science graduates find themselves in just this enviable scenario.

“We have about 165 undergraduate agronomy majors,” says Joe Anderson, head of Purdue University’s agronomy department. “We could double our enrollment, and most graduates would still walk away with multiple job offers.” 

Drew Ratterman, who recruits employees for Dow AgroSciences, says there aren’t enough qualified plant science graduates to meet the demand in the ag input and production industry. “Ag is experiencing 8 percent compound growth as a group,” he says. “We have more need than before, and we’re seeing a higher frequency of retirement as baby boomers leave the workforce.”

Enrollment in agriculture is on an upswing around the country. At Purdue, undergraduate enrollment in agriculture, 2,658 at the start of the 2012-13 academic year, has been steadily increasing for the past decade. But for some areas of the agribusiness sector, the increase in ag students—and graduates—isn’t coming fast enough.
"Purdue is in the best position nationally to train the next generation of plant scientists."

Marcos Fernandez
Director, Academic Programs in Agriculture

Being able to supply graduates to a rapidly growing industry starts with getting students through the door and into corresponding academic programs. Ag recruitment personnel continue to battle the “cows and plows” stereotype with students strong in STEM subjects (science, technology, engineering and mathematics) who often have an outdated view of agriculture as just crop and livestock production.

“Yes, we are farming, but people are surprised by what else we are,” says Marcos Fernandez, director of academic programs in agriculture and associate dean of Purdue Agriculture.

In a new recruitment campaign to inform students about career opportunities in agriculture, food and natural resources, the College of Agriculture is paying particular attention to the plant sciences.

“Purdue is in the best position nationally to train the next generation of plant scientists,” Fernandez says. “I hope the campaign will help us get this exposure.” The college is also hiring a plants sciences recruitment and outreach coordinator to draw attention to the opportunities in these program areas with precollege students and teachers. Industry and university officials agree that they need everyone thinking not just STEM, but STEAM, with the “A” for agriculture.

**Competing for Graduates**

Ratterman says large companies such as Dow AgroScience, Monsanto and John Deere as well as small, independent ones are all vying for the same limited pool of candidates, which is not nearly big enough to go around. With a shortage of agriculture graduates, companies pull from other sciences, such as pharmacy, biology or chemistry. Ratterman says additional training is required for new hires who don’t have a background in agriculture. “We have to teach them the basics about agriculture,” he says. “The more employees understand how the end product is used on the farm, the more valuable they are to us.”

Sweeney is just the type of high-achieving student the industry pursues. Sweeney’s not from a farm background, but as a 10-year-old he had more than a passing knowledge of agriculture. He’s already completed one internship—at Beck’s Hybrids last year—and has another lined up with AgReliant Genetics this summer. During the academic year, he works in the research lab of Karen Hudsom, a molecular biologist with the USDA Agricultural Research Service unit at Purdue.

As an agricultural ambassador for both the college and the agronomy department, Sweeney now talks with prospective students to help dispel misconceptions about agriculture. “I had some of the same misconceptions,” he admits. “But when I came to Purdue, those misconceptions were blown away pretty quickly. Ag here is diverse.”

**Takeaway Message**

Ratterman is hoping that bright, young, science-bound students will see what Sweeney did: rewarding careers with opportunity for growth and the chance to make a difference. “Companies are not only selling to producers but also helping them manage production, what product to use and when to apply,” says Joe Anderson. “In order to do that, employees need to understand plants and soils. Agriscience needs qualified people on both the research and commercial side. Demand is being fueled by this increased service component.”

And it’s not likely to change in the near future. A strong agricultural industry, which fared better than many others through the economic recession, is also buoyed by high commodity prices and a strong export market.

In November, Ratterman met with agriculture representatives from Purdue, Iowa State and Illinois to strategize how to best attract high achievers in math, science and business, and students who want to work for the greater good, as well as those with an inherent love of agriculture. “They emphasize many jobs don’t require an advanced degree—there are plenty of options for graduates with a bachelor’s degree. Since graduating in December 2007, soil and crop management major Cassie (Haskett) Misch has pursued a career licensing soybean and wheat genetics to seed companies. She anticipates the rapid expansion of trait technologies in corn, soybeans and wheat will continue to fuel job growth in the plant sciences.

Together, industry and university officials hope their combined efforts impart this takeaway message: Plant sciences give students the knowledge and tools to solve tough global challenges and make a difference in the world.

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**In Their Own Words**

**Students in spotlight for Purdue Agriculture recruitment campaign**

This year, college-bound high school students and their parents will get a new view into Purdue University’s College of Agriculture—one told by ag students in their own words.

“We wanted to become more visible to prospective students, both those who are from agriculture and those who aren’t,” says Marcos Fernandez, director of academic programs in agriculture and associate dean of Purdue Agriculture. “Today’s agriculture is broader and more diverse than ever.”

The new recruiting push is designed around students who represent the college’s 11 academic departments. “The Experience campaign visually expresses what it means to be a student in the College of Agriculture in 2013 and beyond,” Fernandez says.

Among the students profiled are agricultural and biological engineering major Anthony Hubert, a native of New Jersey, who wanted the “chance to be part of a Big Ten institution and the chances of a lifetime,” and animal sciences major Bailey Farrar, who comes from an Indiana family with deep agricultural roots and a legacy of Purdue Agriculture graduates.

No matter their hometown or academic major, most students share common ground, according to Fernandez. “Our students have a strong service commitment. Agriculture students are less about self and more about others.”

Fernandez, an animal scientist, didn’t come from a farm background. He was considering zoology or biology as a major at Illinois State University. An astute college advisor steered him into agriculture when Fernandez said he wanted to work with animals and help feed the hungry. Likewise, food science major Molly McKneight wanted a career where she could make a difference. She initially looked at nursing and other health sciences but discovered that she could help fight global hunger through agriculture.

The multimedia Experience campaign was developed by the Departments of Agricultural Communication and Agricultural Information Technology and is being implemented across the college.

“The word ‘experience’ embodies our education in agriculture,” Fernandez says. “We’re about active and engaged learning—in the classroom and through undergraduate research, internships, study abroad and service to others. Everything we do develops students’ ability to apply basic principles to solve problems. If we ever needed the best and brightest who want to make a difference with their lives, the time is now and the place is here—Purdue Agriculture.”

Bailey Farrar is among the students featured in a new Experience Purdue Agriculture student recruitment campaign. The campaign website, ag.purdue.edu/experience, will be launched in early May.
Profile

Hunger Fighter

As an Indiana high school delegate to the 2009 Global Youth Institute, Molly McKneight made a promise to herself to live up to the inscription “Hunger Fighter” on a small button she wore.

Sponsored by the World Food Prize Foundation, the institute runs concurrently with an international conference on food security and nutrition. “I was exposed to a world that was completely foreign to me,” says McKneight, who was in the audience when Purdue University agronomy professor Gebisa Ejeta received the 2009 World Food Prize. The experience changed her life in ways the then-Carmel High School senior could not imagine. “Through the World Food Prize I learned about global food insecurity, and I became determined to be part of the solution,” says McKneight, who is currently studying abroad at the University of St Andrews in Scotland.

Her next step was applying for a Borlaug-Ruan International Internship to work with a scientist at an international research center. She was selected and, four days after graduating from high school, departed for Ankara, Turkey, to spend the summer with a regional office of the International Maize and Wheat Improvement Center.

It was quite a leap for a student who barely a year before had only what she describes as “a vague idea” of food science. She and her mother, a Purdue alumna, attended a campus visit day in spring 2009 and met with Donna Keener, academic coordinator for the Department of Food Science. “I didn’t know what to expect going in to the meeting, but I remember walking out and telling my mom, ‘This is what I want to do; this is where I want to be,’” she says.

“Food science wasn’t what Molly was thinking coming in, but she was open to listening,” Keener recalls. “I handed her a flier (on the youth institute). It was a great opportunity, and she grabbed on to that. Molly is the type of person who will be successful in whatever she chooses.”

As a sophomore, McKneight was approached about a food-technology opportunity in Africa. She spent the summer in Dakar, Senegal, developing an instant, fortified cereal product for the Senegalese food market.

In spring 2012, she reunited with Ejeta as an intern with Purdue’s Center for Global Food Security, which Ejeta directs. “I’d go home and tell my roommates, ‘I can’t believe what we talked about today. These great minds I get to work with—I pick their brains all the time.’”

McKneight also enrolled in Ejeta’s graduate-level class in plant breeding, a field she will begin research in later this year. “I’m more and more interested in plant sciences, genetics and breeding,” she says. “There’s so much left to discover. If you want to solve these big global challenges, you often have to study something that is ridiculously small.”

McKneight was recently notified she’s a finalist for a Harry S. Truman Scholarship. Each year, hundreds of college juniors compete for the national award that recognizes students committed to careers in public service. The first Purdue student to reach the final round, McKneight made a quick return trip to the U.S. in late March for a final interview—taking one more step in keeping her promise to become a hunger fighter.
For many years, farmers markets have been the standard for finding locally produced foods. There are more than 7,800 farmers markets in the United States, with 164 of them in Indiana. Now, the popularity of local foods is helping drive new distribution methods in the state, including community-supported agriculture programs and food hubs. Hubs give farmers greater access to markets; they are also convenient for consumers, who can see what farms have to offer each week. Additionally, food hubs give restaurants, schools and hospitals a way to purchase more local foods.

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