Welcome to the latest issue of ABE@Illinois, which focuses on food and its sustainable production. Norman Borlaug, an American agronomist, humanitarian, and Nobel Peace Prize Laureate, said, “Food is something that is taken for granted by most world leaders despite the fact that more than half the population of the world is hungry.” In these pages, you will learn about a suite of teaching, research, and outreach activities pertaining to food production that demonstrate the breadth and depth of what we in ABE do and why it matters.

Leading-edge robotic technologies have been developed for in-field monitoring of multi-crop health and development. In the case of outreach, currently approved methods of on-farm euthanasia of livestock and particularly pigs show scope for improvement. An engineer and economist team up to investigate interventions for grain storage that are deemed acceptable by farmers in India. Four of our alumni reflect on the wide range of career opportunities in food production that our graduates can tackle and thrive in. In addition, opportunities abound for students to learn both inside and outside the classroom about food in local and global contexts. TSM 311, the annual meeting of the Association of Public Land-Grant Universities held a large session on campus hunger last fall. A 2016 survey, sponsored in part by the University of California at Berkeley, included 3,700 college students at 26 campuses and eight community colleges. Of the students surveyed, 20 to 25 percent were food insecure—without consistent access to food. Many experts believe that number is high and say more research is needed, but Kalita says, “I don’t care if the number is 25 percent or five percent. What if it is only five percent? We have 40,000 students at this campus. That means 20,000 of them are hungry, and they could be sitting in my class. That’s unacceptable to me.”

Kalita is quick to point out that “these aren’t students who spend all their money on beer and now they don’t have enough to buy food. These are often first-generation students who work hard to pay for their tuition, their housing, and their books, in that order. They think food is something they can sacrifice, but hunger can seriously hinder their work.”

PU SH Conference

Coming to the University of Illinois

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Prasanta Kalita

“IT opened my eyes. I had no idea so many college students in the United States of America attend class hungry. It got inside my head.”

How many students on a college campus go to class hungry? It’s a question most of us have never considered, but Prasanta Kalita believes it’s an issue we need to address. Kalita, associate dean for the ACES Office of Academic Programs, has been a professor in agricultural and biological engineering since 1999. He is organizing the effort to bring a national conference, Presidents United to Solve Hunger (PU SH), to the Urbana-Champaign campus on March 15–18, 2018.

Kalita’s research focuses on water management and environmental sustainability, and he has worked extensively in food security issues around the world. In 2016, then-Chancellor Barbara Wilson asked Kalita to attend a PUSH conference at the University of Missouri. “It opened my eyes,” Kalita says, “I had no idea so many college students in the United States of America attend class hungry. It got inside my head.”

The issue of college-student hunger is drawing attention in several circles of higher education. The annual meeting of the Association of Public Land-Grant Universities held a large session on campus hunger last fall. A 2016 survey, sponsored in part by the University of California at Berkeley, included 3,700 college students at 26 campuses and eight community colleges. Of the students surveyed, 20 to 25 percent were food insecure—without consistent access to food.

Many experts believe that number is high and say more research is needed, but Kalita says, “I don’t care if the number is 25 percent or five percent. What if it is only five percent? We have 40,000 students on this campus. That means 20,000 of them are hungry, and they could be sitting in my class. That’s unacceptable to me.”

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Local organizations combating hunger include the Eastern Illinois Food Bank, which provides food for pantries in a 77-county area, including Champaign County. The Wesley Food Pantry has two locations, one on the local UIUC campus, the other on the Parkland (community) College campus in Champaign. For its Urbana pantry, Wesley has two student-only hours the first Monday of each month.

U of I President Tim Killeen has called the upcoming conference a “wonderful opportunity” expected to draw up to 150 university presidents, chancellors, and deans, as well as 200 students. The conference has been scheduled to directly follow the Urbana meeting of the UI Board of Trustees to encourage trustees’ attendance. PUS H is a consortium of universities from around the world that have the collective mission to end hunger and poverty both locally and globally. Over 90 university presidents from five continents have agreed to make food and nutrition security a priority on their campuses.
ABE in the World of Food Production

A degree from the Department of Agricultural and Biological Engineering opens the door to career opportunities as varied as the graduates who pursue them. Conducting animal nutrition research in Minnesota, developing an indoor aquaponics farm in New York City, providing smallholder farmers in Africa and Asia with appropriate technology, and managing the construction of sub shops around the country are just four ways ABE@Illinois alumni are making a difference in the world of food production.

Tatiana Lust

Being able to combine work with learning gives Tatiana Lust the most satisfaction in her position as a senior data and statistics analyst for Cargill Animal Nutrition (CAN). “I often learn something new, like some methodology while analyzing data statistically, a skill while developing a tool for data consolidation, or a programming language while developing engines for more efficient data analysis,” says Lust. “I even learn some bits on animal nutrition while interacting with animal research scientists.”

Lust began work with CAN after receiving a Ph.D. in agricultural and biological engineering from Illinois in 2012. “I began as a technical consultant in animal housing and data analyst in Brazil, my home country. I was transferred to CAN’s animal research campus in Elk River, Minnesota, in 2014.”

Cargill, which has been in the agricultural and food business for more than 150 years, reaches 70 countries through its global operations. “As part of Cargill’s animal nutrition data and data team, led by Neil Platon,” says Lust, “I work to improve our data collection and processing on agricultural animal research. Extracting knowledge from the data collected is key to understanding animal responses and to developing new ingredients and products.”

Lust’s research at Illinois was in environmental control and animal welfare. “I loved the time I spent at the Environmental Research Lab. I cared for about 150 hens, monitored the research apparatus and its instrumentation, and interacted with everyone involved in the project, from undergraduate students to professors.”

Lust says her degree from Illinois provided her a strong foundation. “I learned the fundamentals in agricultural and livestock production, plus statistics in the classroom, with great and knowledgeable instructors. I had exposure to state-of-the-art research and the opportunity to work on a team to learn more about the practical side of agriculture animal production.”

“Lust, but certainly not least, were the lessons I learned from my advisors, Angela Green and Richard Gates,” says Lust. “The contributions they made to my personal and professional development were invaluable.”

Lust and her husband recently made the decision to live in a healthier lifestyle, so “we reeducated ourselves about nutrition, and I work out four days a week to do cardio and strength training,” she says. Lust also gets involved in Cargill’s volunteer programs. She has delivered Meals on Wheels, helped distribute foods and essentials to families in need, and made blankets to take to children needing them.

Does Lust have any advice for ABE graduates? She says, “You have to keep learning new things. The world’s pace of change through technological advancements and increasing environmental awareness is only getting faster; so it’s important to keep up with those changes in order to remain competitive in the job market.”

“But she concludes with a smile, ‘you have to enjoy the ride!’”

Nico Hawley-Weld

“It’s exciting to be in a business that contributes to sustainable food production,” says Nico Hawley-Weld. “We want to make it possible for people to have access to affordable fresh produce, so our goal is to design, build, and operate farms that can be built anywhere and compete on the cost of fresh produce.”

Hawley-Weld is a senior agricultural and mechanical engineer for Edenworks, a ten-person startup in New York City. Edenworks’ industrial-scale indoor aquaponics farms turn vacant spaces into food production facilities that grow, process, and package fresh produce and seafood. “When I was earning my master’s in ag and bio engineering, I had a lot of interest in precision farming. My roots are in mechanical engineering,” says Hawley-Weld, “and I knew I wanted to be somewhere that my training was critical to the company. That led me to look at controlled environment farming. I heard about Edenworks, and it turned out they were going to be hiring a mechanical engineer. So I applied and got the position.”

The Edenworks system uses fish grown in tanks with a special type of bacteria that turn fish waste into fertilizer. The fertilizer is used to grow vegetables in trays that can be stacked more than 20 feet high. The plants filter the water as they grow. As the company’s website states, “This system is called aquaponics, it’s been around since the Aztec[s], and it’s glorious.”

The company grows a variety of leafy greens (chard, kale, mustard greens, and radish greens) for packaged salad as well as tilapia and striped bass.

“Right now we’re raising tilapia,” says Hawley-Weld, “because they’re a very hardy, robust fish that can thrive in varying environments. As we’ve advanced our expertise in fish farming, we’re now also moving to a higher value but more sensitive species.”

Hawley-Weld says that in his role as an engineer, “one of the most exciting things for me is building a knowledge base on horticultural and food processing automation. Our core business is selling produce, so we grow leafy greens and sell them to retailers, and we’re a technology company as well. We develop a lot of the technology that we use in-house. But we’re not in the business of selling growing systems—we sell food. Eventually we want to be able to build farm systems across the country, but at the moment we’ve just expanded in the New York City area.”

Though Hawley-Weld is new to New York City, “my sister moved here a year before I did, so I have a bit of a community,” he says. “There are a lot of interesting things going on in the greater New York area. I’m pretty athletic—I do some weightlifting, and I’ve started surfing. That’s something I picked up only recently, but I see myself putting in a lot of time with it!”
“We want to make sure farmers are not just producing more, but they’re producing it sustainably. That’s an important goal for our consortium.”

Tim Rendall

A trip to Sierra Leone to develop a low-cost job planter for smallholder farmers changed the trajectory of Tim Rendall’s career path. “I did a lot of water research with [ABE professor] Richard Cooke as a TSM undergraduate, and I decided to pursue a master’s with him, looking at the water quality of tile drainage from farm fields in Illinois and how to sustainably reduce nitrate pollution in our waterways. During my graduate studies I had the opportunity to travel to Sierra Leone for a small agricultural development project, and this started my engagement in international food production. We were trying to develop a new technology to reduce drudgery and improve food production for smallholder farmers, and now that’s where I’m working today.”

Rendall is project manager for the Appropriate Scale Mechanization Consortium (ASMC). Members from the University of Illinois College of ACES include Rendall, Alan Hansen, Prasanta Katta, KIC, Ting, and Alex Winter-Nelson. Other institutions involved in the project are Archer Daniels Midland Institute for the Prevention of Postharvest Loss, Winter-Nelson. Other institutions involved in the project are Archer Daniels Midland Institute for the Prevention of Postharvest Loss, Morton Buildings or FS for job openings, but his interest was piqued by a Jimmy John’s ad on monster.com. “The job description enthralled everything I was looking for. I didn’t think I had a shot, but I interviewed and had an offer before I graduated.”

Kevin Short graduated in 2001 with a degree in TSM and says, “Dr. Burak was very persuasive,” says Short with a laugh. “By the end of that meeting, I was sold. I was going to be a TSM major, and I was going to do all those great things Dr. Burak said I was going to do.” Short graduated in 2001 with a degree in TSM and says, “Burak was right. With the background I had, I was an great fit.”

Rendall says ASMC is currently in the testing phase for much of the technology in all four countries. “Depending on the country,” he says, “we’ll soon be looking at sustainable business models surrounding the technology. We need to make sure our mechanization efforts will remain useful beyond the life of our project.”

Rendall and Hansen returned from a trip to Cambodia in early January. “To keep progress moving,” says Rendall, “we’re taking a staggered approach to our travel. One or two team members will go one month. Another team member follows up a month or two later, and then another after that. It’s a way to fully utilize our resources and have continual feedback to keep the project on target and meeting our goals.”

Rendall looks ahead, he says he’d be interested in moving up to larger projects in the same field. “But I enjoy this job very much, and I will stay with it for a while. It’s a great opportunity.”

Kevin Short

As a high school senior, Kevin Short came to the Department of ABE to talk with professor Phil Burak about the technical systems management program. “Dr. Burak could be very persuasive,” says Short with a laugh. “By the end of that meeting, I was sold. I was going to be a TSM major, and I was going to do all those great things Dr. Burak said I was going to do.”

Short graduated in 2001 with a degree in TSM and says, “Burak was right. With the background I had, I was a great fit.”

During his college years, Short says, most TSM students looked to companies like Morton Buildings or FS for job openings, but his interest was piqued by a Jimmy John’s ad on monster.com. “The job description enthralled everything I was looking for. I didn’t think I had a shot, but I interviewed and had an offer before I graduated.”

Short began work as construction manager when there were 85 Jimmy John’s sub shops. “The office had a loose set of standards for the franchises, but no one really knew how to follow them, and there was very little accountability. The company wanted to standardize the system, I didn’t know that when I was interviewing, but when I got here, they said, ‘You’re the guy, so figure it out.’

Short says the business as a whole continually recruits and has hired many Illinois graduates. Tyler White—a TSM senior and tight end for the football team—was an intern in the fall of 2017. “It’s important to be willing to learn new ideas quickly to be successful in this organization,” Short says. “I grew up on a small family farm and worked there for many years, but I also worked for a machine shop, a welding company, an electrician, a roofer . . . . I even worked for a psychologist. When I was a student at Illinois, I worked in the ABE structures lab with Steve Ford. So I learned and soaked up as much as I could, and my degree in TSM pulled all that together. This opportunity wouldn’t have been there if it wasn’t for my degree at Illinois.”

Short enjoys hunting whitetail deer, and he obtained a private pilot’s license six years ago. He and his wife, Lisa, have a six-year-old son, Tucker. Tucker loves to fly with mom and dad, especially to visit his uncle’s farm in Kansas. “He can’t get enough tractor time with his uncle,” says Short. “He’s kind of like me. He’s interested in everything.”

Kevin and Lisa Short

“The company wanted to standardize [their franchise] system. I didn’t know that when I was interviewing, but when I got here, they said, ‘You’re the guy, so figure it out.’”

Kevin Short

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Improving Food Security in South Africa

Water research can take many forms. One of the past year’s most interesting projects in the Department of ABE was an aquaponics system developed by Illinois students in cooperation with students from the University of KwaZulu-Natal (UKZN) in Pietermaritzburg, South Africa.

“Our goal” says Nora Onstad, graduate student in ABE, “was to benefit farmers and improve their food security by creating a small-scale, inexpensive aquaponics system for small farms and communities.” Onstad worked with a student from Northeastern Illinois University, Alyson Cervantes, and three students from UKZN (Susan Green, Tyler Harvey, and Vikoux Roux) to design and construct the system, which combines aquaculture (fish) with hydroponics (plants).

“This project was the South African equivalent of our senior design capstone class,” says Onstad. “Students at Illinois make connections, through email and Skype, with the students at UKZN to decide on a project. The students at UKZN do a lot of the design work and calculations before we get there; when we arrive, we help them build and test their project.

“Construction was broken down into three parts: plant structure, control system, and fish tank,” Onstad continues. “We helped build some components of each part, but we mainly focused on the plant structure. This included building the wooden frame, cutting and sanding PVC piping to create a plant bed, puncturing plastic cups to create pots for the plants, and installing a plumbing system that connects to the other components.”

Onstad and Cervantes also did some work on the large fish tank. “Because we want to maintain a continuous growing cycle, we have to keep the baby fish separate from the adult fish, or they’ll get eaten. So we created a small cage that fits inside the larger tank.”

Onstad said the model was built primarily to show proof of concept, “but our supervisor was a faculty member in the department, and he has a Ph.D. student who will use the model in a future research project.”

“Overall,” says Onstad, “it was a great opportunity for some hands-on construction experience in engineering. We had the use of a huge workshop, and the manager was always there to help and teach us.”

These students are all part of a larger program that began more than a decade ago, Alan Hansen, professor and interim head of ABE, who is a native of South Africa, began organizing study abroad trips to his alma mater to offer students in both countries opportunities for international collaboration and learning. In recent years, Paul Davidson, another ABE professor, has taken leadership responsibilities for the program.

This year Davidson added a new angle to the trip; he opened it up to the inaugural cohort of the WE CAN program, which is open to underrepresented minority freshman and sophomore undergraduates.

Davidson, along with Michelle Green, a wildlife biologist in animal sciences with the Illinois Natural History Survey, is a coordinator of WE CAN—Wildlife Engineers Co-managing Agriculture and Nature. The two faculty members collaborated to apply for a grant from USDA, which they received, to fund the program. The grant of $280,000 over four years provides funds for two cohorts of six to eight students to receive two summers of high-quality experiences. These experiences will help students bridge the gap between biology and engineering to solve contemporary issues at the interface of agriculture and wildlife.

For the inaugural WE CAN cohort, Davidson and Green recruited qualified students from the University of Illinois, Northeastern Illinois University, and Tuskegee University. Out of 40 applicants, six were accepted, two from each school. The program’s first of two summers involved six weeks of laboratory and field-based lessons on the Illinois campus, as well as educational field trips throughout Illinois and Indiana. This was followed by the four week trip to South Africa.

“We knew we could combine the study of wildlife and the study of engineering and teach students how those areas could overlap. And South Africa’s a paradise for wildlife, so it all came together well.”

Next summer the six students will return to campus for a focused research project with the Summer Research Opportunities Program. A second cohort will be recruited for the summer of 2019. Along with other researchers in the College of ACES, Davidson and Green were encouraged to look for opportunities for collaboration when applying for the USDA grant.

“We realized this could be an amazing program,” said Davidson. “We knew we could combine the study of wildlife and the study of engineering and teach students how those areas could overlap. And South Africa’s a paradise for wildlife, so it all came together well.”

Other ABE students who joined the WE CAN participants for the South Africa trip included Alisha Weatherspoon, sophomore in ABE; Aden Cambre, sophomore in ABE; Hussain Kurawadwala, senior in TSM; and Brian Rodriguez, senior in TSM.

Wildlife in South Africa is beautiful and bountiful.
A small field-phenotyping robot named TerraSentia could be the key to big changes in agriculture. Phenotyping is the characterization of a plant’s growth, development, and other properties such as drought resistance, disease resistance etc. In-field characterization of the performance of a crop variety is essential for crop breeders to breed more productive and profitable crops for farmers.

“The lack of crop phenotyping has traditionally been very labor intensive,” says Girish Chowdhary, an assistant professor in ABE. “Right now, people use a variety of simple tools in the field to take certain measures, such as stand count or stem diameter, the presence of lodging, or the height of the plant. “This robot is a new tool that can be used to capture and store that information under the canopy, so we don’t have under-the-canopy data and a lot of aerial data, but all interested in TerraSentia. Earthense has received orders from early adopters in universities and industry, and we deliver the phenotyping robots to these early adopters in April 2018. “In three years, our robots will be doing initial management tasks, and robotic teams that scout and manage your farms are coming in five to 10 years,” Chowdhary concludes. “I strongly believe we will see robotic farm management in our lifetime.”
Food Security at the Intersection of Engineering and Economics

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rofessors Kent Rausch (agricultural engineering) and Kathy Baylis (agricultural economics) are studying the use of various postharvest technologies to improve income and food security for thousands of smallholder farmers in Bihar, India. Their project is funded by the Archer Daniels Midland Institute (ADM) for the Prevention of Postharvest Loss, and the team from Illinois is collaborating with researchers at Rajendra Agricultural University and Bihar Agricultural University.

The project was approved in January of 2015, says Rausch, “and we received funding of almost half a million dollars. The team traveled to India in March of that year to meet our colleagues and begin work.”

The study involves 4,000 farmers in eighty villages across five districts. “ADM chose Bihar,” says Baylis, “because malnutrition rates are very high, poverty rates are very high, farm sizes are very small, and even a little bit of harvest loss can be massively harmful.”

The team includes graduate students Pallavi Shukla and Hemant Pullabhotla. Both have undergraduate degrees in engineering and master’s degrees in public policy, and each is now working toward a Ph.D. in agricultural economics.

“We began the project,” says Shukla, “by doing a baseline survey of the farmers to gather information about what they were growing, what kind of inputs they were using, and their current levels of food security, food diversity, and household assets. Before we started experimenting with any technologies, we wanted to find out what farmers were currently using and what awareness they had of certain technologies.”

Baylis says more: “We wanted to choose a technology that the farmers would be interested in and be willing to adopt, as opposed to something we thought they should be interested in.”

“ADMI chose Bihar,” says Baylis, “because malnutrition rates are very high, poverty rates are very high, farm sizes are very small, and even a little bit of harvest loss can be massively harmful.”

The bags, provided by GrainPro/GrainSafe and made of food-grade, UV-resistant flexible PVC, are designed for both indoor and outdoor storage. After farmers were given information about the benefits of using the bags, a lottery was established to determine the price of a bag and who would be able to purchase it.

“We asked each farmer to write down the maximum price he would be willing to pay,” says Pullabhotla. “That varied greatly, depending on the perceived benefit of the seed. A farmer who had a small quantity of grain and wanted to store it for a longer period found it worthwhile to pay more because it was crucial for his food security. So he said, ‘I’m willing to pay 30 rupees.’ For another farmer, if grain storage was not that big an issue, he said, ‘I’m only willing to pay 10 rupees.’”

Each farmer was then given a bag that had a price written on a slip of paper inside. If that price was less than what he said he was willing to pay, he was allowed to buy the bag at the reduced price. If it was more, he couldn’t purchase the bag.

“So the lottery simulated the actual market,” says Baylis. “In the real world, if you want a product on the open market but the cost is too high, you don’t buy it. It was the same here. If the price a farmer pulled out was more than he ‘had said he was willing to spend, he couldn’t buy the bag.”

The economics team is now following up with farmers who were part of the initial lottery.

“One of the information we’re gathering includes data on usage,” says Shukla. “Did they use the bags to store grain for personal consumption, to sell grain in the market, or to store seed for the next season?”

Shukla says there is some laboratory evidence that seed stored in hermetic bags has a higher germination rate because the bag controls mold and moisture levels. “Now we’re getting anecdotal evidence from our field workers that the germination rate is much higher for bagged grain, so it looks like it’s something that happens in the field as well as in USDA labs.”

Baylis says, “We also want to know if using the bags changed the farmers’ marketing behavior at all. In other words, when storage is cost effective, do they wait to sell grain later, possibly at a higher price, instead of selling it immediately?”

And based on their experience, says Pullabhotla, “would they use the bags again? Would they pay as much—or more—the next time? Does the benefit of the technology exceed the cost of adopting it?”

Because these and other questions are sometimes answered by engineering and other times by economics, it’s easy to understand why the two disciplines need one another. Rausch addresses the engineering behind the hermetic bags.

“Pests and mold are the major problems in grain storage,” says Rausch. “The hermetic bag is airtight. But if you poke a hole in it, no matter how small, it’s not going to do what you want it to do. At the beginning the concern was that rodents might chew through the bags. It wouldn’t take much to damage the seal. Even if the rodents didn’t take the grain itself, the quality would go downhill.

“Now this is just anecdotal information,” he continues, “but apparently rodents can’t even smell the grain once it’s sealed in the bag. So in that regard, the bags are performing very well.”

Mold is another factor in postharvest grain loss, but from experience with a past project using similar bags, Rausch learned mold can be prevented, he says. “Because they’re hermetically sealed, air can’t circulate in those bags. The grain naturally respires and gives off CO₂, which prevents mold.”

Farmers know that moldy grain is bad, and they scrape off the moldy layer,” says Shukla, “but you don’t need to see mold to have mycotoxins in the grain. We were amazed to learn through our surveys that not one of the farmers knew about mycotoxins.

Small farmers sell their grain through traders, who don’t test for mycotoxins, but the traders go on to sell to poultry processors and distillers who are aware of mycotoxins and test for them. “We’re not sure why there seems to be a gap in this information transfer in the supply chain,” says Shukla. “It’s very puzzling, and we hope to learn more about it.”

“We worry,” says Baylis, “because if grain can’t be sold, farmers keep it for their own consumption. The result of eating moldy grain can express itself in a variety of ways—diarrhea, headaches, nausea. Because it’s hard to pinpoint moldy grain as the problem, families continue to eat it. But when we collected grain samples from the current crop and had them tested, 32 percent of the samples had high level of aflatoxins.”

Baylis says the high malturhation rate in Bihar might be connected to the grain. “Malnutrition rates there are a bit of a puzzle, because India has relatively high food consumption compared to some of the poorest countries in sub-Saharan Africa. So what’s going on?”

“It might just be that food isn’t allocated equally throughout the household,” she says. “But what if it’s an issue with something that’s blocking the body from being able to take up nutrients—like aflatoxins? We don’t know that’s the case, but I do think we should consider it as part of the bigger picture we’re looking at. What if by solving one problem, we solve another? Wouldn’t that be great?”

The final year for this project is 2018, but the need for collaboration between engineers and economists will continue.

“We’ve found that you can’t just go into a country with the perfect technology drop it on people, and walk away,” says Rausch. “It doesn’t work.”

“Real economists can’t go and say, Look at all these market problems you have,” says Baylis. “What are people supposed to do with that? But when you combine economics with engineering to find an appropriate technology that brings economic benefits, you’re going to make a difference.”
Sometimes it’s surprising how little people know about where their food comes from,” says Angela Green, associate professor in agricultural and biological engineering. “I don’t think that’s exclusive to the student population,” she continues. “I think it’s reflective of our society as a whole. So one thing we hope to accomplish in TSM 311 is to engage our students in a meaningful discussion about our food supply.”

Rodriguez, also an associate professor in the department, Food Web. “When students begin the food web, “ says Green, “they have an idealized viewpoint, and they’re able to engage in conversations that are productive in terms of thinking through the logistics and the consequences of the whole system.”

The course has three basic components. “First,” says Rodriguez, “we look at the current state of food and agriculture and the challenges we face. Then we move into a historical perspective: How did those current states come to be? Finally we look forward, into the future of food and agriculture.”

“It’s a simple summary of a course that is more complex upon a closer look. We begin with a look at topics such as modern animal production and animal welfare, human and environmental interactions, and sustainability,” says Green. “All of which lead to discussions on bioethics. “From there we segue into historical perspectives, starting with hunter–gatherer societies,” she continues, “then moving through the emergence of agriculture and continuing into the systems of different societies and civilizations and how they evolved around agriculture.”

“Intensification comes next,” says Rodriguez. “Different forms of agriculture evolved, but for the most part, the western world greatly intensified that evolution into an industrial process. That’s what we deal with and where we get most of our foods today.”

“For a semester we have about 30 majors across 10 or 11 colleges,” Green says. “It’s a nice mix of backgrounds, and the students bring a variety of perspectives.”

“Students set their own ground rules in a team contract, and they are encouraged to develop topics that aren’t covered in the lectures. Their five weeks of preparation includes learning how to build content in a productive fashion. “The debate they end up delivering is full of content,” says Green, “because the aim is not just winning the debate, but educating their peers.” Topics of particularly lively past debates include prohibiting cutting down rainforests for agriculture, better regulating the labeling of food supplements, and subsidizing bioenergy.

A 10-page paper is also required of each student. Students receive feedback on a draft of their paper, and they review the work of another student. “A peer-review exercise is a requirement for an advanced composition class on campus,” says Green. “Our peer-review exercise involves some engagement with others, but it’s primarily self-driven, and a very different way to think about communicating.”

At the end of the year, the course uses a Twitter activity to get the students’ perspective on what they’ve learned and the future of the food web.

“We organize the class in small groups—two or three students—and ask them to tweet about something they’d like to see in the future food web,” says Rodriguez. “If they want to remain anonymous, we can send the tweet out on the class Twitter account; alternately, they can tweet it on a personal account so long as they use the class hashtag. I use that information to analyze each group’s data over the next week, and when students come back to class, they can see how thematic ideas come out of these simple thoughts.”

“A Unique Class, A Unique Classroom

All of these projects are enhanced by the use of 209 Huff Hall, one of seven FLEX (Illinois Flexible Learning Experience) classrooms on campus. The room in Huff Hall was the first general assigment classroom made available for faculty from any department, and Green and Rodriguez jumped on the opportunity to use the space for TSM 311. Each of seven six-person collaborative workstations has a dedicated digital display and whiteboard to support group work. Flexible furniture allows for easy reconfiguration to support the class’s whole-room discussions, debate team preparation, one-on-one peer review consults, and group Twitter activity.

https://iflex.illinois.edu/
Expanding the Options for On-farm Euthanasia

Producing a safe and affordable food supply involves a broad spectrum of agricultural issues. In the livestock sector, animal welfare in production facilities is one such issue. Producers must balance environmental issues and animal welfare with profitability and a secure food supply. Not only must farmers provide adequate food, water and shelter for the animals that make it to market, they must also provide humane treatment for the animals that don’t. And that’s a subject many people are not comfortable with.

Richard Gates, ABIE professor, is working on a research project that involves the design and testing of alternative systems for humane on-farm euthanasia. Gates comments on the changes he has seen in the process over the last decades.

“I’ve worked with animals all my life, and today’s society has become much more insulated from their food sources. When Grandpa had a handful of pigs on his farm, he’d look at the runt and make the decision he needed to make,” Gates says. “Should he bottle-feed it or euthanize it? Either way, he’d take care of it.”

Gates says today’s larger production facilities face the same challenges when making those decisions, but on a much larger scale. The USDA Quarterly Hogs and Pigs reported the March-May 2017 pig crop at 39.3 million head. Although the number of pigs saved per litter increased over the same period last year, it’s estimated that 10 percent of those piglets will need to be euthanized.

“When the problem is disease, injury, or some kind of congenital defect, there are usually one or two pigs per litter that need to be euthanized,” Gates says. “The focus of our project is to take the methods allowed by current regulation and improve on them.”

Methods approved by the American Veterinary Medical Association (AVMA) include injected barbiturates, blunt-force trauma to the head and the use of carbon dioxide (CO₂) as a suffocant, with subsequent death due to respiratory arrest. This latter method has become increasingly popular because it provides a degree of separation between worker and piglet.

“Blunt-force trauma is far and away the more humane method,” Gates says. “They determined what a normal euthanasia looked like under the CO₂ regime, then under the N₂O regime. How long were the piglets conscious, how long were they unconscious, and when did they expire?”

Test results showed that the piglets under the N₂O regime became unconscious almost twice as fast, but overall there was a longer time to death. “If they’re unconscious, does that mean they’re not subject to discomfort? If they spend less total time in distress in a conscious state, is that better than the status quo?” Gates says, “but we’re looking at other alternatives as well.”

Since this past summer, Gates and Lay have designed an on-farm demonstration experiment to expose neonatal piglets to a four-minute dose of N₂O to sedate them, then switch to CO₂ to expedite death. This was compared with standard industry use of CO₂. Results were positive, and the next step is to evaluate the economics and logistical feasibility of adopting the new method.

“There is no perfect system,” Gates concludes, “and it’s not a subject anyone is comfortable with, but it’s necessary. And I think—I hope—we’re making a tough situation a little easier.”
The IBIP Experience

LEOTYN BROWN: IBIP New Zealand 2017

Breath-taking, incredible, astonishing. Asked to describe his experience in New Zealand, those are the first words that come to Layton Brown. “For starters,” says Brown, “I never thought I would leave the United States—by myself! I’m a small-town boy with close family ties. But I’m so glad I stepped outside my comfort zone and took advantage of this opportunity.”

“The fact that a solid piece of land that size was owned by one person was astonishing. We learned the ins and outs of a large merino wool production farm and saw some amazing views.”

Brown is a senior in TSM, majoring in mining and agribusiness. Although he had an interest in studying abroad, he wasn’t sure he could juggle school and internships with international travel. When he discovered the IBIP program immediately followed the school year (May 13 to 27 in 2017) and finished up before internships started, he says, “I lined up perfectly. And when I learned we were going to New Zealand, well, that was a very expensive addiction.”

IBIP divides students into study groups; Brown’s group looked at agriculture technology and its impact on New Zealand’s agricultural practices. “The group also had time to take advantage of some of Brazil’s more picturesque tourist opportunities. We visited Iguazu Falls, then flew to Buenos Aires, and finished up in Parigi. We learned the ins and outs of Brazil’s agricultural system, what they produce, and some of the cultural aspects,” says Brown.

Another visit that challenged Brown was going to a farmers market, where chickens roamed freely and music played. An elderly Brazilian woman danced with one of our students and sang us songs in Portuguese. She told us the secrets to a long life: Health first, then family and friends. None of the material things mattered. She told us we would live good lives, and she hugged us before we left.

Phillips and M. Phillips

Marcous Phillips

IBIP South America 2016

Justin Kubal is a 2017 TSM graduate, living in Placita, California, and working as a cost engineer with Truebeck Construction, based in Redwood City.

Kubal traveled to South America with IBIP in 2015. Although he said the trip held many highlights, Kubal named the LAR Cooperative Soybean Facility as memorable. “We met with the plant manager and chemical engineer of the facility,” says Kubal. “They gave a brief presentation about the history of the company that was established in 1964, and we saw the steps within the soybean production process that produces about 400,000 tons of soy per day.”

A second 2015 tour was the Itapúa Binacional Hydroelectric Dam, located along the Parana River that forms the border of Paraguay and Brazil. The dam produces 20% of Paraguay’s electricity and generates 1,400 megawatts of electricity. It supplies 15 percent of Brazil’s total electricity and 80 percent of Paraguay’s electricity. Another visit that challenged the students was the trip to IDEC, the Brazilian institute for Consumer Defense. “They were very hospitable and gave us amazing coffee—much stronger than American coffee! There was a presentation on the danger of pesticides and GMOs,” says Kubal.

And a discussion of legislation and political actions taken to prevent the use of GMOs and pesticides in farming practices. That sparked a lot of questions and pretty lively discussion between the students and presenters regarding conflicting views of farming practices.

The students also experienced a brief and whirlwind interaction after their visit to IDEC. “We went to a farmers market, where chickens roamed freely and music played. An elderly Brazilian woman danced with one of our students and sang us songs in Portuguese. She told us the secrets to a long life: Health first, then family and friends. None of the material things mattered. She told us we would live good lives, and she hugged us before we left.

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Justin Kubal

IBIP South America 2016

“After the trip to IDEC, the Brazilian institute for Consumer Defense, ‘I saw how different markets and industries function, we got to meet and talk with government officials, and we visited some of the largest corporations in Brazil. It was just cool.”

The IBIP Experience

International travel, exposure to the economic environment of different countries, cultural diversity, and breathtaking scenery. The College of ACES’ International Business Immersion Program (IBIP) offers all of this and more, and students come home from their experience forever changed.

Justin Kubal (left) and Marco Phillips (right)
What we call corn, much of the world calls maize. Regardless of its name, corn sustains indigenous peoples around the world.

We want your feedback about ABE@Illinois. Please send your comments to Leanne Lucas at llucas@illinois.edu.