Last summer, when I took over the ASABE presidency from Sonia Maassel Jacobsen, I said that I would continue to promote her platform: E-I-O—Expertise, Image, and Outreach.

It’s clear that the Expertise of our members is strong, and growing. Just consider the wide range of technical advances that was showcased by the AE50 Awards and the AE Gold and Silver Awards this year. Advances in biological processing, information systems, and equipment automation were honored. For more than 100 years, ASABE members have set high professional standards. Today, we are recognized as the leading experts—the “go-to guys”—in important new fields, such as biorenewable energy.

Our Image is also improving. Higher food prices are in the headlines, along with stories about sustainability, environmental impacts, and climate change. As a result, the public is becoming more aware of the challenges that we face in securing our food, water, and energy. On a recent trip to California, I saw billboard battles over water rights. The signs stated that “water for agriculture means jobs.” In other words, ag and bio engineers must find ways to use water more efficiently as a matter of economic necessity. The challenges of providing low-cost renewable energy are also in the news, and employers are recognizing our unique skills in this area. Several universities are reporting that their ag and bio engineering graduates have a higher placement rate than other engineering majors.

Now Outreach is the key. This issue of Resource is devoted to people who are reaching out and making a difference on this planet. From Honduras to Haiti and other parts of the world, in public schools and on college campuses, ASABE members are improving lives in fundamental ways. Yes, these stories are inspiring—and they are also about finding practical, engineered solutions to real-world problems. That’s what ag and bio engineers do best. Together, working through our Society, we’ll continue to “build better” and provide everyone with the essentials of life.

Tony Kajewski
KajewskiAnthonyH@JohnDeere.com

P.S. Here’s some news I just learned at press time: A reprint of Joel Cuello’s terrific article, “Notes from a Decade of Travels in a World Without Walls,” from the May/June 2012 issue of Resource appears in the Spring 2013 issue of The Bent, the quarterly magazine of Tau Beta Pi, the engineering honor society. Hit the internet and check it out: www.tbp.org/pubs/Features/Sp13Cuello.pdf.

That’s Expertise, Image, and Outreach all in one. Congratulations, Joel!

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**events calendar**

**ASABE CONFERENCES AND INTERNATIONAL MEETINGS**

To receive more information about ASABE conferences and meetings, call ASABE at (800) 371-2723 or e-mail mtgs@asabe.org.

**2013**

**July 21-24**

ASABE Annual International Meeting.
The Westin Kansas City at Crown Center and the Sheraton Kansas City Hotel at Crown Center, Kansas City, Missouri, USA.

**2014**

**Feb. 10-12**

Agricultural Equipment Technology Conference.
Seelbach Hilton, Louisville, Kentucky, USA.

**April 7-11**

Evapotranspiration: Challenges in Measurement and Modeling from Leaf to the Landscape Scale and Beyond.
Raleigh, North Carolina, USA.

**July 13-16**

ASABE Annual International Meeting.
Montreal, Quebec, Canada.

**2015**

**July 26-29**

ASABE Annual International Meeting.
New Orleans, Louisiana, USA.

**ASABE ENDORSED EVENTS**

**2013**

**May 19-22**

Harrah’s Veranda Hotel and Tunica Conference Center, Tunica, Mississippi, USA.

**May 27-19**

3rd Climate Change Technology Conference (CCTC 2013): Engineering for Global Sustainability.
Concordia University, Montreal, Quebec, Canada.
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Editor’s Note: In 2012, Sukup Manufacturing Co. won an AE50 award for the Safe T Home™, the company’s entry in ASABE’s annual AE50 competition, which recognizes outstanding agricultural innovations that have potential for broad impact. Based on a grain bin, the Safe T Home provides simple, sturdy housing for disaster victims or impoverished people and is also suitable for use as a school, church, clinic, or other purpose. Well ventilated, with an aerodynamic shape and ballasted design, the Safe T Home can withstand high winds, making it ideal for hurricane-prone areas. This article provides an update on Safe T Home installations in Haiti, as well as future prospects for this great idea.

When the time finally came to begin erecting modified grain bins as homes in Haiti, Brett Nelson, safety director at Sukup Manufacturing Co., couldn’t help but wonder how people would feel about living in them. The answer was overwhelming.

“They loved them. They thought they were beautiful,” said Nelson, who spearheaded the idea of modifying Sukup grain bins for use as shelters. Brad Poppen, an ag tech at Sukup, transformed a grain bin into a Safe T Home by adding, among other features, a specially designed roof to keep out heat and create airflow, as well as a ballast system to help anchor the structure.

The 7.0 magnitude earthquake in January 2010 that killed an estimated 230,000 Haitians and left about 1.6 million homeless spurred Nelson to approach Sukup management with the idea of producing the modified bins as emergency housing. Nelson also contacted Carlos Thertus, president of the Haiti Relief Fund. Thertus founded the Haiti Relief Fund in 2004 after Hurricane Jeanne hit, and the organization was stretched to its limits after the 2010 earthquake. A partnership between Sukup Manufacturing Co. and the Haiti Relief Fund led the way to putting homeless Haitian families in new, all-steel homes.

Sheltering those in need

“The donation from Sukup was key to Haiti’s needs at just the right time,” Thertus said. “The homes are expandable, they keep out heat and bugs, and they are completely safe during the hurricane season.” Following the earthquake, many Haitians were homeless or living in tent cities. Safe T Homes provide a safer, more durable alternative to tents and other temporary structures. In addition, Safe T Homes are virtually impenetrable and feature lockable doors and windows, providing a level of personal security felt by few in Haiti.

Global Compassion Network, a charitable, non-profit organization based in Eagle Grove, Iowa, learned of the Sukup Safe T Homes and the company’s desire to help those affected by the hurricane in Haiti. Ken DeYoung, one of the organization’s founders, had been flying humanitarian missions to Haiti for some time. He contacted Sukup about establishing a partnership. Company president, ASABE Fellow and Past President, Charles Sukup, P.E., and chief financial officer Steve Sukup agreed to donate 14 Safe T Homes, and Nelson began coordinating the design and fabrication and putting the word out about them.

“I received dozens of calls from people who were interested—church organizations, missions, non-government organizations,” Nelson said. Along with Global Compassion Network, Sukup Manufacturing partnered with the Iowa Food & Family Project, an initiative launched by the Iowa Soybean Association, and Meals from the Heartland, an Iowa-based nonprofit that has packaged more than 20 million meals for hungry families around the world. The goal was to deliver 48 Safe T Homes by the spring of 2012.

It takes a village in the storm

In February of 2012, Nelson and three others from Sukup, along with members of the Global Compassion team and Iowa Soybean Association representatives, erected the first eleven Safe T Homes near Les Cayes, Haiti. The “Village
of Hope” now has 49 Safe T Homes, arranged in seven circles of seven homes each. Each circle has a gazebo at the center as a gathering place. There are two wells, a water tower, and bathroom facilities with showers. The Village of Hope also has gardens, so residents can grow their own food.

During each day of that February build, at least 100 local people gathered at the construction site, hoping to land a job building the homes, Nelson said. “If you put your wrench down, it was gone. But not because they were stealing it. They wanted to work.” Nelson and others from Sukup Manufacturing—including Nick Sukup and employees Luke Erickson and Joe Germain—divided the local people into teams to work on sidewalls, roofing, and ballast boxes, and each team built two houses per day. The last of the first eleven homes was put up almost entirely by Haitians. The Safe T Homes not only provided many Haitians with a roof over their heads, they also provided security, pride, and independence, and the local people were excited to be part of that.

A key to the Safe T Home as transitional housing is the ease with which it can be built. An experienced team of four can put one up in just a few hours using minimal tools. Even a novice crew can have one up and ready in a day. The homes are a great value compared to other temporary shelters, and they are much more comfortable than one would imagine, Nelson said.

The standard Safe T Home is 5.5 m (18 ft) in diameter, with 2.4 m (8 ft) sidewalls and a peak of 4.1 m (13.5 ft). With 23.6 m² (254 ft²) of floor space, each home can sleep ten or more people. The home is made entirely of galvanized steel, so it’s impervious to termites and moisture. It features a double-layer roof system that displaces heat, vented eaves, two windows that can be locked from inside, and a water collection system. The Safe T Home can also withstand high winds, is virtually earthquake proof, and has a life expectancy of 75 years. When Hurricane Isaac hit Haiti in 2012, it passed directly over the Village of Hope. All of the Safe T Homes weathered the storm perfectly.

“It’s extremely gratifying to be part of this effort and for our employees to use their expertise in a way that serves a higher purpose,” says Steve Sukup, company vice-president. “We believe in this product and the good that it can do for the Village of Hope and for people anywhere who need safe and affordable shelter.”

The mission continues, hope builds

Some of the Safe T Homes built in Haiti are still being used as temporary shelters for the original move-in families. Those families are learning agricultural and entrepreneurial skills, but they will move out when they find employment and adequate housing elsewhere. Then other families will move in. Prospective residents are screened by Global Compassion Network. “A larger Safe T Home has now been built and is being used as a clinic, and another as a church,” said Nelson. Nelson, Nick Sukup, and other crew members from Sukup Manufacturing have returned to Haiti to help put up more Safe T Homes. Each time, they are greeted by scores of eager workers of all ages, all wanting to do their part to strengthen their community.

There are now more than 70 Safe T Homes in Haiti, and Global Compassion Network is in the process of acquiring another piece of property for a second village. The acquisition process takes a long time, Nelson said, because of the complex property laws and record-keeping systems in Haiti.

There is also interest in Safe T Homes in other parts of the world. A group of individuals from Uganda who are involved with Iowa State University’s Center for Sustainable Rural Livelihoods (CSRL) recently visited Sukup Manufacturing Co. in Sheffield, Iowa. Henry Kizito Musoke, who was the head of Volunteer Efforts for Development Concerns (VEDCO) at the time of the visit, was enthusiastic about the possibility of using Safe T Homes in African countries such as Uganda.

Charles Sukup’s daughter Elizabeth has been to Uganda several times through her work with the CSRL, and she’s also excited about the possibility of using Safe T Homes there. “The fact that the doors and windows lock is wonderful and would be a blessing to women and children in Uganda and other countries,” said Elizabeth. Charles noted, “It’s interesting that the shape of the Safe T Homes is very similar to the traditional huts we’ve seen in Uganda. The fact that the Safe T Homes are steel is quite a change, but the shape is like the round huts with conical, thatched roofs that the local people are already familiar with.”

Sukup Manufacturing Co. is celebrating its 50th anniversary in 2013. As part of the celebration, the company is putting together a “50 Homes for Humanity” campaign that will involve raising funds to provide Safe T Homes to more communities in undeveloped nations like Haiti and Uganda. For more information on the project, visit: www.sukup.com/Buildings/144/Safe-T-Home.

Nicole Poock, Advertising Director, Sukup Manufacturing Co., Sheffield, Iowa, USA; npoock@sukup.com.
Jaime Vicente Chavez Leon graduated from the Department of Agricultural and Biological Engineering (ABE) at the University of Florida (UF) with a BS in Agricultural Operations Management and an MS in Agricultural and Biological Engineering. During his senior year and graduate studies, he was actively engaged in several research projects in the Bioprocess Engineering Research Laboratory. He constructed and operated pilot-scale anaerobic digesters for biogasification of sugar beets and municipal organic wastes, contributing to the development and optimization of high-solids leach-bed digester designs for these feedstocks. He later carried out fermentation studies to characterize the growth, substrate utilization, and inhibition kinetics of a mutant E. coli strain that was genetically engineered to utilize D-lactate as a method for purifying a mixture of D-lactate and L-lactate obtained from thermal hydrolysis of waste polylactic acid (PLA) bioplastic for reuse of L-lactate.

Since graduation, he has been working in the trilateral U.S.-Brazil-Honduras Renewable Energy Program, which is funded by USAID/Honduras and USAID/Brazil and managed by the Institute of Food and Agricultural Sciences (IFAS-Global, Walter Bowen, Professor and Director) at UF. This program was launched in August 2012 with the goal of generating clean, renewable energy to improve the living conditions of the rural population in Honduras. The initial plan called for using solar energy for electricity and the energy needs of Honduran farmers. As part of this initiative, a low-cost solar dryer was designed for distribution to farms as a means of preserving the quality of grains and coffee. A subsequent initiative of this program, currently underway, is to deploy low-cost biodigesters.

As project manager for the program, Jaime’s role is to identify, assess, and facilitate investments in renewable energy applications that help poor rural households improve their incomes. The objective is to provide access to some form of renewable energy for at least 10,000 poor rural households within five years. Jaime will also be assisting the implementation partners (public and private institutions) in Honduras to meet the long-term objectives of (1) increased agricultural sector growth and (2) improved nutrition for women and children. During this process, he is actively engaging institutions in the United States, Brazil, and Honduras that are dedicated to promoting renewable energy.

“The most challenging part of my job,” Jaime says, “is establishing trust between local agencies and developing synergies by addressing the issue of renewable energy in a cooperative manner. The University of Florida has an advantage as a neutral, external partner with a superb reputation. Part of what I love about this job is being able to use UF’s presence and name for positive influence. Who wouldn’t want to work with UF for continuing education related to renewable energy?”

“At the same time,” he says, “it is imperative to work with other international agencies in order to avoid duplication of effort and establish an integrated system, so that we can publish and share information related to the experiences and success stories of all the parties involved in renewable energy.”

Jaime leads a team of four technicians who are tasked with implementing renewable energy technologies and education within the project communities. His role includes recruiting and training these technicians in advanced renewable energy technologies while keeping in mind the importance of complementing the technologies already in place. He intends to expand the skill set of local regulatory agencies,
Children are born engineers

The first solar dryer that Jaime installed has a special significance because of the circumstances that he relates:

“The morning of the setup, we set out to find Señor Milan’s house, which is high in the coffee mountain regions of Marcala in Honduras. Small farmers such as Señor Milan have approximately 0.7 ha (1.7 acre) of land available for growing coffee. With limited mobility, they are not able to expand production and they have a limited harvest, which is threatened every year by the coffee plagues. The best, simplest response to these limitations is to increase the value of the coffee by drying it at the time of harvest. Farmers usually build concrete patios and dry the coffee pods with sunlight. This drying process takes several days, during which time the coffee is vulnerable to rain and pests, but drying reduces the moisture content from 80 percent to about 30 percent and gives the growers a marginal profit.

“The goal of renewable energy is to introduce useful technology while respecting the customs and techniques that have been passed down for many generations. Therefore, the most effective way to increase the value of the coffee crop was to protect it during drying. We constructed solar dryers in which the pods are arranged on raised screens and covered, like a greenhouse. This simple arrangement increases the temperature by more than 20°C (68°F) and further reduces the moisture down to 12 percent. In addition to reducing the drying time from days to hours, this arrangement also prevents animals from disturbing the beans, and it protects the beans from mold and fungus, which can severely reduce the value of the crop. The cost of the dryers is usually about $350 U.S. The farmer shares the cost of the lumber and the labor required to set up the base. Once the base is constructed, project technicians install the PVC pipe and the clear plastic material that covers the whole unit.

“The best part of this project is when the farmers and their children help in the construction. They get the idea right away, and their keen eyes and practical natures are astonishing. For example, when three technicians could not figure out how to tighten the metal cables to make sure the clear plastic did not sag, the children devised a way to tighten each cable using a simple metal nail, which was driven perpendicular to the cable and turned so as to make a small loop in the middle of the cable, thus creating tension. This allowed all the metal cables to be set and socar, the local word for tighten.

“It was an ingenious solution, and we developers need to recognize and encourage that kind of thinking. As I watched the leader of the pack of children at work, I dubbed him Maestro Socador—Master Tightener. The kids loved that, and they eagerly helped me build the next dryer, for the uncle of Maestro Socador.

“Now the young Maestros are helping me promote the technology from within the community, making my task even more meaningful. A simple solution to a long-term problem, brought about with the help of clever local children, is much more persuasive to governmental bodies, and other potential funders, than any technical seminar could be.”

“Most of all, I’m grateful that I gained research and project management experiences as a student in ABE, which is now allowing me to progress quickly and effectively with my responsibilities here in Honduras. My job has been growing as time goes by—I’m a victim of my own success! I find myself in meetings with people twice my age working through problems of organization and technical assistance. And our local contacts are grateful for our contributions, even when we share with them something as small as a journal article. What I think of as a simple gesture is considered extremely valuable.”

Jaime intends to return to graduate school to pursue a PhD in renewable energy and continue to make a difference in Honduras, or wherever he permanently lands.

ASABE member Pratap C. Pullamanappalli, Associate Professor, Department of Agricultural and Biological Engineering, University of Florida, Gainesville, USA; pcp pratap@ufl.edu.
Editor’s Note: ASABE member Michael Sama, ASABE’s 2012 “New Face of Engineering,” was the recipient of the 2011 Sunkist Young Designer Award for his exceptional engineering creativity and achievements that have greatly improved the way biological and agricultural engineers collect and aggregate data for complex measurement systems.

“Making a difference” isn’t new to Sama. An engineer associate in the Department of Biosystems and Agricultural Engineering at the University of Kentucky, Sama is involved in the design and implementation of custom control algorithms, user interfaces, and numerical analysis tools for research and extension projects. He also provides practical laboratory experience to undergraduate and graduate students in the areas of analog electronics, digital electronics, embedded systems, data acquisition, instrumentation, and programming.

Sama was the lead engineer in the design and implementation of the controls and interface for the Fan Assessment Numeration Systems (FANS) project. FANS is a laboratory-grade research tool for measuring airflow in animal housing applications that is currently being used by universities in the United States, Canada, and China to quantify ventilation properties that affect animal welfare and emission rates. In recent years, the FANS project has expanded to allow testing of a wider range of fan sizes, and it is being continually updated to meet user needs.

Since joining the Department of Biosystems and Agricultural Engineering (BAE) at the University of Kentucky (UK), I’ve had the pleasure of working with students, faculty, staff, and producers on a wide variety of projects. These projects have ranged from building research tools for measuring ventilation rates in poultry houses to developing software for accessing an internet-based RTK network on the farm. A consistent theme among these projects is bridging the gap between electronics and agriculture. I also focus on bridging these engineering disciplines in my role as an instructor. I am pleased to say that the gap is getting narrower every year, and we continue to benefit from the use of electrical technology in agricultural applications in the form of improved efficiency, safety, comfort, and access to information.

Bridging the gap in the classroom

Students pursuing a degree in a BAE program are normally required to gain some experience with basic electrical engineering (EE) principles through instrumentation or circuits courses, regardless of their individual areas of interest. Teaching these types of courses to BAE students can be challenging because it requires a balance between theory and application. Much of what we do as agricultural and biological engineers is applied engineering, and teaching purely toward applications is therefore attractive. Many students prefer this approach when studying an unfamiliar discipline because they don’t get bogged down with deriving “useless” equations. However, a problem with this approach is that it can be difficult to translate complex solutions from one problem to the next without understanding the underlying theory. As an instructor teaching instrumentation to graduate students, I put an emphasis on theory, and I try to incorporate the students’ areas of interest to fulfill the application component.
One way to make EE theory more approachable to BAE students is through the use of analogous systems. BAE students typically have a strong theoretical background in mechanical systems, including fluids and heat transfer. The fundamental principles that govern these mechanical disciplines overlap with EE theory, and that overlap can be exploited to assist teaching any dynamic system. An example from this past year was a graduate student project that involved designing a device to automate grain volume measurements in a silo. The students used a laser distance sensor, mounted to a servo-controlled gimbal, to take an array of measurements across the surface of grain from the top of the silo. The project successfully blended theory on pulse-width modulation and step response with the practical application of reducing error when manually estimating grain volume.

Bridging the gap outside the classroom

Opportunities to teach EE principles to BAE students also exist outside the classroom. One of the best examples is the ASABE International 1/4-Scale Tractor Student Design Competition. Several areas of the competition provide an incentive for students to incorporate electrical technologies into the design of their tractor. As one of the advisors to the UK Wildcat Pulling Team, I encourage students to take an incremental approach to engineering design. This is particularly important when working outside of their familiar discipline. An example of an incremental design has been the team’s use of electronically controlled steering. The design originated with a simple electric linear actuator, coupled with a momentary rocker switch, to control the direction of motion. Over the past several years, the team has iteratively improved the mechanical linkage, the operator interface, and the control method to improve the system’s performance. The mechanical switch was replaced with a potentiometer to provide finer control of the steering angle, and an embedded controller was incorporated to measure operator inputs and adjust the outputs accordingly.

The team also began implementing safety components into their designs, particularly in the steering system to safeguard against uncontrolled failure. Without a mechanical backup, electronic steering must be robust enough to mitigate a more serious failure of the tractor when any part of the steering system malfunctions. The team addressed this through the use of a CAN-based digital motor controller, which was programmed to fail in a safe manner under a variety of circumstances. Through the implementation of this subsystem, students have gained practical electrical design experience with industry-standard serial communications and embedded control. By incrementally improving the design each year, rather than starting over annually, the students are better able to distribute their efforts across all of the subsystems that make up the tractor.

The students are not the only people who benefit from this design competition. Team advisors along with judges and volunteers from industry and ASABE gain practical feedback on how students are progressing through their undergraduate programs. Due to the level of interaction among students, industry, and our professional society, the ASABE International 1/4-Scale Tractor Student Design Competition is one of the most effective multidisciplinary educational and networking tools available. All of the teams that compete in this competition amaze me with the creative designs and implementations that they develop each year. And it’s an enormous amount of fun.

ASABE member Michael P. Sama, P.E., Engineer Associate, Adjunct Instructor, Department of Biosystems and Agricultural Engineering, University of Kentucky, Lexington, USA; michael.sama@uky.edu, www.bae.uky.edu/michael.sama/.
The people were small, and the problem was large (in a manner of speaking): how would a group of second grade children move Mrs. Seecs-Mielnik, who was standing on a plank flat on the floor, 6 m (20 ft) across the room and out the hall door? Their tools consisted of a shovel and three pieces of 6 cm (2.5 in.) electrical conduit, roughly 1 m (3 ft) in length. No, this wasn’t one of those “I’m OK, you’re OK—we’re all winners” team building exercises. It was a serious engineering challenge using simple machines. After a demonstration of three simple machines—the lever, the inclined plane (wedge), and the axle—the children were up for the task. If the ancients could cut, transport, and lift stones weighing many tons in order to build pyramids and such, then surely these kids could move Mrs. Seecs-Mielnik out the door. According to Wedel, “The local weatherman does one, a couple of college professors, teaching students, and ag engineers—it’s quite a mix. I started spreading the word on ag engineering by volunteering for this. I did a demonstration on ‘Why Do Ships Float?’ It was Archimedes’ principle for kids. It went over well, and a ‘real’ teacher taking photos thought it was pretty cool. The kids did, too, especially at the end when I plied them with freeze pops. I was asked to become a regular in the classrooms. When my son told me they were learning about simple machines, I volunteered again, or my kids volunteered me, or maybe the teachers were talking.” Wedel answered the call, and his simple demonstration had a big impact—one that can be replicated wherever the local school is willing and an engineer is eager to share.

Editor’s Note: ASABE member Andrew Wedel’s children attend a school where the parents and teachers work together to find enrichment opportunities. The school’s annual Math and Science Saturday (MASS) has given Wedel an opportunity to teach young children the basics of ag and bio engineering. Each year, the school solicits proposals from parents for math and science related demonstration projects, with each demonstration lasting about 30 minutes. When the proposals are in, each of the students (K-6) signs up for three demonstrations to attend. When the big day comes, the turnout, including students and parent volunteers, is overwhelming, especially for a Saturday morning. According to Wedel, “The local weatherman does one, a couple of college professors, teaching students, and ag engineers—it’s quite a mix. I started spreading the word on ag engineering by volunteering for this. I did a demonstration on ‘Why Do Ships Float?’ It was Archimedes’ principle for kids. It went over well, and a ‘real’ teacher taking photos thought it was pretty cool. The kids did, too, especially at the end when I plied them with freeze pops. I was asked to become a regular in the classrooms. When my son told me they were learning about simple machines, I volunteered again, or my kids volunteered me, or maybe the teachers were talking.” Wedel answered the call, and his simple demonstration had a big impact—one that can be replicated wherever the local school is willing and an engineer is eager to share.

May/June 2013
Little People + Simple Machines = Future Engineers + Big Jobs
Andrew Wedel, P.E.

“The most basic fundamentals, refined to perfection, are actually your most advanced techniques.”
Bill Koll, wrestling coach emeritus

Have you ever had a job where, at the end of the day, you were sore?

I have. It’s no secret that, today, fewer and fewer people are working with their hands: digging holes, milking cows, throwing hay, hauling wood, or driving nails. The pervasive trend of encouraging practically everyone to attend college, along with a service-based economy, will lead to fewer and fewer people who know how to do things with their hands. Simple machines are a necessity of such work. Imagine life without them. It occurred to me that the children, whether they’re future engineers, doctors, truck drivers, plumbers, or even lawyers, could benefit from an understanding of the fundamentals of simple machines. Simple machines make work easier, and what eight-year-old isn’t looking to make work easier?

I started by explaining a shovel, not so much from the standpoint of something used for scooping, but instead as a tool that cuts (wedge) and lifts (lever). I also took one of the pieces of conduit and extended the length of the shovel’s handle to demonstrate how increasing the length of the lever with respect to the fulcrum enabled me to lift a weight with less perceived effort. This was a sharp bunch of kids, and simply measuring “perceived effort” wasn’t enough. I constructed an incrementally adjustable lever (aka a see-saw, which I’ve learned is the pariah of school yard equipment). I also brought along a scale. By adjusting the fulcrum and consequently the lever length, I demonstrated how 27 kg (60 lb) of force provided by one child could lift 82 kg (180 lb) of me. They were getting it! How could the students lift me using even less force? For that they would need a screw jack—the screw being more or less an inclined plan wrapped around a shaft. But there’s more. If you’ve ever used a screw jack, you know there is only one way to turn the screw: a lever. I stood on the jack and had a student pull a spring scale attached to the jack lever. It took just 4 lb of force to lift me using this particular, very well lubricated screw jack, which boasted a 20 ton capacity. The kids were really getting it.
Now the practicum: moving Mrs. Seecs-Mielnik

I described the problem, showed the students the objects at their disposal, and they came alive. After all, what kids wouldn’t jump at the chance to move their teacher out the door? Here’s how they did it. First, they took the shovel edge (wedge) and slid it under the plank. With a tilt of the handle (lever), one end of the plank was off the floor. Under the plank went an axle. The maneuver was repeated again on the other end of the plank. With a slight push, Mrs. Seecs-Mielnik was on the go. But wait, there was a problem within the problem: the plank was about to roll off the two axles. Someone realized that the third piece of pipe could be place in front of the plank, and with a choreographed positioning and repositioning of the three axles, along with a gentle push, Mrs. Seecs-Mielnik was out the door.

According to the American Society of Engineering Education ...

According to the American Society of Engineering Education ...

In 2011, roughly 4 percent of bachelor degrees were conferred to engineering majors. This suggests that, in the class of 25 children assembled before me, assuming that they do not all graduate from college, fewer than one will become an engineer. Roughly speaking, if this little demonstration leads just one of them to an engineering degree, then I’d be on par.

And now a confession: my interest in talking to children on the topic of simple machines wasn’t totally altruistic. Personally, I wanted to recall this fundamental topic for myself. In my job as a working engineer, it is one of the most advanced techniques. On top of that, I am totally bullish on the engineering profession (especially agricultural engineering, but that’s another story). According to U.S. News and World Report, the unemployment rate among engineers is less than 2 percent (as opposed to 12.6 percent for fine arts majors), which is good news.

One of the challenges in recruiting kids to our profession is its difficulty. So, it is up to us. We need to get kids excited about working with things, figuring things out, contributing to the greater good, and asking “why?” These fundamental skills—along with several semesters of math, chemistry, and physics—are the underpinnings of engineering. We need to show how engineering can make difficult things easy, or at least a lot more interesting. Talk to kids about science and engineering, even if there is a little something in it for you besides the gratifying feeling of helping someone to see something new and different.

ASABE member Andrew W. Wedel, P.E., General Manager, Agricultural Division, McLanahan Corp., Hollidaysburg, Pa., USA; awedel@mclanahan.com. Headline photo © pixeltap | Fotolia.com.

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180 lb lifting 90 lbs on a see-saw with no mechanical advantage.

Force amplification by increasing lever length: 90 lb lifts 180 lb.

Repositioning the axles for forward travel.

A shovel (wedge and lever) lifts the plank to accommodate the axle.
Editor’s Note: For the past three years, ASABE member Brian Boman has been working in Haiti to introduce modern agricultural production practices, specifically drip and sprinkler irrigation and protected agriculture. Along with many challenges, he has had some great successes. “Brian Boman continues to play an outstanding role in the development of rural communities in Haiti. Not only is he is the father of the Greenhouse Revolution, which triggered the most impressive technical leap ever achieved by small farmers in the country, but he also helped resolve water problems in a village called Furcy,” said Jean Robert Estime, Chief of Party to the USAID/WINNER project in Haiti. “Now children can find water at their school, and women can do their laundry when they need. Brian is unique and deserves our deepest respect and most sincere gratitude.”

Before Haiti established its independence from French administration in 1804, it was the world’s richest and most productive colony. Today, Haiti has the distinction of being the poorest country in the Western Hemisphere, and one of the poorest countries in the world. Many Americans continue to share their expertise in Haiti in an effort to improve the quality of life for the nation’s earthquake-ravaged citizens and to reduce the Caribbean country’s decades-long dependence on foreign aid. My job is to help Haiti’s agricultural producers reduce the adverse environmental impacts of farming and ranching operations. A large portion of my time is devoted to the USAID Watershed Initiative for National Natural Environmental Resources (WINNER) project in Haiti. Over the last four decades, food imports have replaced most of the country’s agricultural operations. WINNER’s mission is to rebuild the country’s infrastructure and help its citizens become independent from foreign assistance.

Three years ago, one of my goals was to introduce simple greenhouse structures that could be built, maintained, and operated by farmers in the mountainous regions that cover most of the country. The first small greenhouses (hoop houses) were constructed from PVC pipe and wood framing at a demonstration farm that we developed through the WINNER project near the town of Kenscoff. On terraces cut into the steep mountain slopes at elevations of 1,800 m (6,000 ft) or more, farmers in this area historically produced flowers and vegetables for local markets. In recent decades, these farming practices, along with deforestation, have led to tremendous erosion of topsoil whenever tropical storms or high-intensity thunderstorms occurred.

Unlike the hot and often dry conditions at the lower elevations, such as the Cul de Sac plain east of Port au Prince, the cool temperatures at the higher elevations are ideal for many vegetable and fruit crops. However, low nighttime temperatures, rain, and problems with insects and diseases have resulted in reduced, often low-quality, yields. With assistance from my University of Florida colleagues, we conducted demonstrations of both in-ground and vertical production systems in hoop houses. The hoop houses greatly reduced pest problems and enhanced growing conditions, resulting in higher yields and excellent quality. Our initial studies showed that the structures could generate enough income to pay for themselves in six to nine months. The vegetable and flower buyers in Port au Prince soon became very interested in the hoop houses because the quality of the produce was equal to or better than that of the produce that they were importing from the Dominican Republic and the United States.

Local farmers were encouraged to visit the demonstration farm and learn about hoop house construction and operation, including how to produce high-density crops in vertically stacked containers mounted on pipes using drip irrigation.
Interested farmers were organized into associations that were set up to grow and market produce. To encourage adoption of the hoop houses, a grant was made to a farmer association near the town of Furcy. This grant funded the construction of nine hoop houses. The structures stand on new terraces near the top of the mountain where there is road access. To protect the terraces, vetiver and peach trees have been planted to stabilize the soil. These techniques were severely tested this past summer when tropical storms Isaac and Sandy pummeled the area with torrential rain and high winds. A few of the hoop houses were damaged by tree limbs and wind, but the peach trees and vetiver protected the terraces, and overall the damage was minimal. The association has been so successful that the farmers constructed additional houses at the site and now produce a year-round supply of flowers and vegetables.

Word of the success of the Furcy hoop houses spread throughout the region. More and more farmers became interested in protected agriculture. The WINNER project and Haiti’s Ministry of Agriculture have now teamed up to encourage the adoption of this technology. So far, more than 200 hoop houses have been constructed in the Kenscoff area and are in full operation. A big step will take place this year, as there is a new goal to have 1,000 greenhouses in production by 2014. The farm businesses, and the villagers’ livelihoods, are growing along with their produce.

Thomas Jacques of Haiti’s Ministry of Agriculture is leading a cost-sharing program for the new hoop houses. Through this program, the government will provide 80 percent of a farmer’s start-up costs for installing hoop houses. Those who have been farming on the open mountainsides must also agree to cease that destructive practice. The farmers are eager to sign on to the cost-sharing program because they’ve seen others, who are already involved in hoop house production, achieve crop yields that can’t be equaled by production on open land. The hoop houses also produce higher-quality crops—healthful, ripe, and free of wind and insect damage. In addition, each farmer must also agree to assist the government’s reforestation efforts and plant 50 new trees. And these trees bear fruit—peaches, apples, mangoes, and coffee beans. In the mountainous regions of Haiti, the conditions are perfect to produce these varieties and others.

A continuing challenge for the farmer association in Furcy was water for irrigation. Even with the capture and storage of rainwater, water shortages continued to be a limiting factor for greenhouse production. A natural spring, located at an elevation about 245 m (803 ft) below the hoop houses, had very good flow, but the logistics of pumping water up the steep mountainside made it unattractive. Another spring, located on the property of the local school, the École Nationale de Furcy, was the second best option, but the flow was only about 4.5 L (1.2 gal) per minute. Even though this spring is on school property, there was no running water for the school’s 500 children.

This spring serves as a water source for the village. All day long, women carry 19 L (5 gal) buckets down to the spring, fill their buckets while standing in the mud around the outlet, balance the full buckets on their heads, and then carry them back up the mountain to their homes. Often, young children will be sent to the spring to carry smaller 4 L (1 gal) jugs of water back to their homes. The spring also serves as the social center for the village when the women come to wash clothes—filling their tubs with water from the spring, soap ing and washing by hand, rinsing, and then hanging the clothes on shrubs to dry.

After studying this situation, we realized that the farmer’s association, the villagers, and the school all shared one unmet need: access to water. A plan was developed to meet all three

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Flanked by mums, the author with a worker in a hoop house.

Children at the Furcy school.
needs, and discussions were held with representatives of all the interested parties. Electrical is power is available in the region, but there were no power lines near the spring. And even if there were nearby power lines, the grid is unreliable, and generally the power is on for only a few hours a day. Therefore, solar energy was the best choice for powering a pump.

Fortunately, there was an abandoned cistern below the spring that holds about 11,350 L (3,000 gal). This cistern was used to catch the spring water and serve as a reservoir for the pump. Association members cleaned out the cistern, removing years of accumulated rock, rubbish, and mud. A 24 VDC pump capable of producing about 8 L (2 gal) per minute at 60 m (200 ft) of head was selected. To simplify the installation and reduce the cost of the system, no batteries were installed. Two 60 W panels were installed on a south-facing hillside about 30 m (100 ft) from the spring and connected to the control box. A float switch prevents the pump from running when the water level in the cistern is too low.

Two 2,300 L (600 gal) tanks were installed at the school, at an elevation about 15 m (50 ft) higher than the spring, and supplied by a PVC line from the pump. Similarly, a water line was run about 1,500 m (5,000 ft) from the pump to the storage tanks at the association’s hoop houses, which are about 30 m (100 ft) higher in elevation. The supplies to the school tanks and association tanks are controlled automatically with float switches. A pressure-relief valve on the pump’s discharge line dumps water back into the cistern when the tank valves are shut off.

To complete the installation, a water line was run back down the slope from the school to provide water to the village for domestic and clothes washing. A wash table was constructed so that the women no longer have to squat in the mud while washing clothes, and benches were added so that several women can wash clothes at the same time. While we were working on the pump installation, it became apparent that the spring also served as a community bath. Buckets were used to collect water, and the local people undressed and washed themselves and their children.

Seeing this need and wanting to maximize the use of the spring water, we ran an overflow pipe from the cistern to a tank located farther downslope. When the cistern fills up, water fills this lower tank. This tank is located above a drop of about 2 m (6 ft) on the side of the mountain. This provided a nice place to put in a shower, fed by the tank above.

One day in February this year, a group of women and children from Furcy gathered around the spring, talking nervously when they realized that their lives were changing. They no longer had to stand in the mud to get water and bathe. Instead, they now have access to clean water at convenient locations—near the spring for washing, and below the spring for bathing. The cooks at the school now have convenient access to water to prepare hot meals for the children. Our initial intent—to provide water to the hoop house growers so that they could maintain adequate irrigation when their rainwater reserve was used up—has been accomplished to the benefit of the entire community.

In addition to the hoop house projects, we have also introduced drip and center-pivot irrigation systems in Haiti. Our efforts over the last several years are starting to pay off, as the first major drip irrigation project for 80 ha (200 acres) of process tomatoes is under construction in the Cul de Sac area. Nearby, the first center-pivot irrigation system has already been installed and has generated a lot of interest from landowners. Thomas Jacques, Haiti’s Minister of Agriculture, announced at a recent meeting that he anticipates Haiti will increase its agricultural production in the coming years through the introduction of technology, such as greenhouses and irrigation systems. In particular, Jacques said, “We will increase greenhouse acreage from 7,000 m² to 2 million m² in the next three years.” With time, Haiti can become productive again, just as it was long ago.

ASABE member Brian Boman, P.E., Professor, Department of Agricultural and Biological Engineering, University of Florida, and Statewide Best Management Practices Coordinator, Indian River Research and Education Center, Fort Pierce, Fla., USA; bjbo@ufl.edu.
Editor’s Note: ASABE member Walter Eshenaur grew up as the son of a missionary doctor in rural Ethiopia. For 14 years, Walter witnessed the powerful impact that his physician father had on the health and welfare of rural Ethiopian communities. By the time he graduated from high school in the capital city of Addis Ababa, Walter had determined that he would also serve impoverished communities, wherever that would be. Upon graduating from high school, Walter returned to the United States, where he attended the University of Minnesota. After seven years of college, with BS and MS degrees in agricultural engineering with an emphasis on water resources, Walter and his family returned to Africa.

Years ago, during my time at the University of Minnesota, I had the opportunity to travel to Dupark, Haiti, to design and build a small dam that would create an irrigation reservoir for an agricultural training center for orphans. It took two days of sitting under a spreading breadfruit tree to design the dam (a St. Anthony Falls drop structure) and ten days to build it. We also built and installed a hydraulic ram that used water from the dam to pump a portion of that water to buildings on campus. Today, 27 years later, that dam continues to provide a critical source of water for irrigation and fish ponds and, thankfully, it was not affected by the devastating earthquakes that hit Haiti in 2010 and 2012.

Ethiopia

After I graduated, my family and I relocated to Africa to assume long-term responsibility of a large famine relief and development program in north-central Ethiopia. Over the next seven years, this program became a model for integrating civil and agricultural projects and community health. The program’s accomplishments included:

- Fifty-two community water supply systems, including hand-dug wells, boreholes, and gravity-fed systems, providing more than 50,000 people with clean drinking water.
- Feeding 23,000 mothers and their children over a three-year period.
- Producing fuel-conserving stoves and distributing them to families.
- Constructing a dam to supply water to an 8 ha (20 acre) irrigation system.
- Using “food for work” to hire local labor, 20 miles of gravel road were built, which provided access to remote villages.
- Three large tree nurseries were planted, producing over 2 million seedlings per year.

While in Ethiopia, I was asked to travel to northwest Cameroon to survey and design a spring-fed water storage and distribution system for a large rural hospital in the city of Banso. Shortly thereafter, I traveled to Mali, in the Sahel region of West Africa, to conduct an extensive evaluation of a large water supply project implemented by World Relief, a U.S.-based non-government organization. World Relief works to help the poor and hungry across the globe.

After a successful transition of this program to a local NGO, the United Nations Children’s Fund (UNICEF) approached me about working in community development at the national level. During my four-year tenure with UNICEF in Ethiopia, I traveled throughout the country, working to transfer simple technologies to the household level, including food processing (solar drying and oil extraction), sanitation (the SanPlat latrine system), health (solar power for clinics, including solar-powered refrigerators for vaccines), and water supplies (a distribution network for the AfriDev handpump, and solar-powered pumps).

I was also involved in the successful Guinea worm eradication initiative supported through UNICEF by President Jimmy Carter’s Global 2000 program. Meanwhile, I continued to volunteer my time with various local NGOs in Ethiopia, and I worked with several projects that specifically addressed the affects of urban poverty and sanitation.

Somalia

When my term ended in Ethiopia, the UNICEF regional office transferred me to northwest Somalia (also known as Somaliland). For the next two years, I managed the UNICEF program in Somaliland. Our efforts there focused primarily on...
building the capacity of local government officials to successfully deliver public works projects, such as water supplies, clinic construction, and elementary school rehabilitation, and promoting sanitation through appropriate technologies.

In addition, I was asked to coordinate the entire United Nations program in Somaliland. This included diverse projects, such as land mine removal, road repair, refugee assistance, and, most importantly, government capacity building through financial assistance, training, and policy development.

**Return to the United States**

After 13 years of professional and volunteer work in Africa, my family and I returned to Minnesota, where I joined SRF Consulting Group, Inc., as a water resources engineer. Although I was now living and working in the United States, international service is deeply rooted in me, so I jumped at the chance to return to Haiti in 2002 to assist the community of GrisGris with a new water supply. This project was supported by a church here in the Twin Cities (Minneapolis and St. Paul, Minn.). Following this project, I assisted with another water supply initiative in Haiti, which was supported by a humanitarian organization based in Virginia, providing guidance, design, and a cost estimate for a small but much needed system in rural Cabestor.

A few years later, professional and student chapters of the newly formed Engineers Without Borders (EWB) were established in Minneapolis and at the University of Minnesota (UMN). These chapters initially adopted a number of projects in Ghana, Uganda, Guatemala, and elsewhere.

**Ghana**

In 2005, I was invited by the newly minted EWB-UMN student chapter to assist them in the assessment and design of a water supply system for a school and small village in Ghana, West Africa. I served as mentor to a group of civil, chemical, mechanical, biosystems, and environmental engineering students. As part of the project assessment, two of the students and I traveled to the village of Amponsa. That trip gave me the opportunity to return to my beloved Africa after a six-year hiatus. Our team began with introductions to the school staff and community leaders, and then we conducted a field survey and physical assessment, collected as much site data as possible, and spent quite some time getting to know the community.

One of our most enjoyable times was spending the afternoon with the community leaders chatting and drinking tea together, and the connections we established that day served us well as the project got underway. This personal approach to providing technical assistance remains one of the most important tenets of EWB. Our team returned with enough information for the EWB students at UMN to complete the design of a solar-powered drinking water supply system. Using electricity from solar panels, the system was designed to pump water from a borehole into an elevated storage tank. The water was then distributed to the school and village through several hundred feet of pipe. A year later, with the design and funding in hand, six students and I traveled back to Amponsa to construct the system. Two weeks and many challenges later, the system was up and functioning. It continues to operate today.

**Uganda**

Having built a strong relationship with the EWB student chapter at the UMN through the Ghana project, another EWB-UMN project team asked me to provide a review of their rooftop water harvesting system design and develop a contract for a local well driller in Uganda. They also asked me to become involved in the most recent phase of the project, which included the design and construction of a rainwater collection and storage system for a remote public school in Bugonzi, Uganda, about four hours drive from the capital city of Kampala. The team was comprised of biosystems and bioproducts, civil, and mechanical engineering students.

We traveled to Uganda twice in 2012. On the first trip, we constructed part of the collection system. During the second trip, a few months later, we finished the system and...
handed it over to the community. The highlight of the first trip was the turnout of the Bugonzi community to help the EWB students with construction of two large water storage tanks. They mixed and poured over 20 cubic yards of concrete in just a couple of weeks, all by hand! The highlight of the second trip was how eager the community was to assume full responsibility for the system. This project will continue as the student team, which I still mentor, constructs more rainwater collection systems for small communities.

Guatemala

While I was completing my MS in the UMN Department of Agricultural Engineering, I built and tested several hydraulic rams. The hydraulic ram, invented in 1790, is a simple device that uses the energy of falling water and water hammer to pump a portion of that water to a higher elevation. I completed my research on hydraulic rams in 1985, and I was fortunate to be able to install hydraulic rams in Haiti and conduct hydraulic ram assessments in Ethiopia. Even though the hydraulic ram is a very old idea, it hasn’t been widely adopted throughout the world, so I expected that it would eventually become a lost technology.

However, while conducting an assessment in a remote village, the EWB-UMN Guatemala team came across a fascinating implementation of dozens of hydraulic rams powered by water supplied from a number of micro-dams. These hydraulic rams were being used to irrigate high-value export crops, such as blackberries. The local community asked the EWB-UMN team to help them to rehabilitate the micro-dams, which were becoming silted in, and to help them increase the use of the hydraulic rams. When it came to light that I had some knowledge of this esoteric technology, the EWB-UMN student chapter contacted me. Since then, I’ve developed several hydraulic ram presentations for the students, and I’ve assisted them in analyzing hydraulic ram performance with the goal of improving the device’s efficiency.

Now, after 13 years of international work while living in Africa and another 13 years of volunteer work both overseas and in the United States while living in Minnesota, I have lived out my lifelong dream of serving impoverished communities. My ongoing commitment is to keep building the EWB chapters in Minnesota, and I’m always ready and willing to help out a worthy cause that needs an engineer’s perspective.
We are in a global economy, and students must be prepared to live and work globally. Growing numbers of companies have international offices or plants, as well as overseas suppliers and partners. In addition, more and more positions include international travel as part of the job. Employers are looking for candidates with international experience, so college graduates with study-abroad experience have a real advantage. Employers want students with stamps in their passports!

Academically, the Belgium Environmental Science and Engineering Study Abroad program at Texas A&M University (TAMU) was designed to introduce students to European methods for protecting natural resources. Specifically, the department of biological and agricultural engineering (BAEN) at TAMU takes students to the Katholieke Universiteit Leuven, in Belgium, to study water and water quality issues. The academic program highlights the similarities and differences between U.S. and European methods for protecting and conserving soil and water quality.

Equally important, the cultural part of the program allows students to experience European life. The program was designed to immerse students in different cultures and ways of thinking. While Texas is almost 23 times the size of Belgium, Belgium has three official languages (Flemish, French, and German) with three distinct cultures. In addition, Belgium is centrally located in Western Europe, with quick and easy train travel to The Netherlands, France, Germany, England, and Luxemburg. The Belgian Study Abroad program allows students time to explore these other countries. Traveling throughout the continent greatly expands the students’ international experience.

Multiple universities

A unique feature of the program is that students from other schools can participate by arranging for course credit through their home university. Since the Belgium Study Abroad program was developed specifically for BAEN students, it occurred to BAEN faculty members that the program should be open to students from similar departments at other universities. We began by working with the TAMU Study Abroad office to develop a mechanism to allow students from other schools to participate.

Enrolling students from other biological and agricultural engineering programs from across the country adds another dimension to the cultural exchange component of the program. As students from different universities live, learn, and travel together, they gain a greater understanding of their own country and its diverse cultures, as well as an introduction to European cultures.

In the summer 2012 program, five students from the department of biosystems engineering and soil science at the University of Tennessee joined 17 TAMU students on the program. One of the students from Tennessee reported that she learned more about Texas than she did about Belgium!

Program details

The program offers courses in environmental hydrology and waste treatment processes for junior and senior students. The five-week program consists of two 3-hour courses during the second summer session (July and August), so the students obtain six hours of engineering credit toward graduation. There are also two sections of each class: one for engineering students, and one for non-engineering students. The program includes four field trips and four seminar
The field trips are generally day trips to see European methods for addressing important issues in resource engineering, such as:

- Using manure to produce bioenergy.
- Treating agricultural wastewater with constructed wetlands.
- Collecting, treating, and distributing groundwater and surface water.
- Protecting coastal areas from storm surges using retractable sea gates.
- Treating municipal wastewater.
- Composting municipal organic wastes.
- Measuring groundwater/surface water interactions.

The seminar speakers are from EU and Flemish regulatory agencies and discuss EU methods for soil and water conservation. A typical week in the program consists of classes and seminars all day on Tuesday and Wednesday, and field trips on Thursday, with at least 15 hours of contact time each week. This leaves four-day weekends (Friday through Monday) for the students to travel.

Program participants stay in an international student house in Leuven with other students from around the world, which provides additional opportunities for cultural exchange. Kitchen facilities in the house allow the students to save money by cooking their own meals. All the students on the program rent bicycles and ride 15 minutes from the student house to the classroom building. Bicycles are an essential means of transportation in the Flemish part of Belgium, where K.U. Leuven is located. Flemish is the language of this region, but the vast majority of Belgians speak fluent English.

Program cost

The Belgium Study Abroad program fee is $2,500, which includes the costs for two TAMU faculty members, lodging, seminar speakers, field trips, bicycle rental, and registration at K.U. Leuven. Not included in the program fee are airline tickets, meals, weekend travel expenses, and tuition and fees for the classes. The students are responsible for making their own travel arrangements. They may choose to arrive in Europe before the program starts or stay longer after the program is over. However, all students are expected to meet at the Brussels airport on the first day of the program. To avoid paying out-of-state fees, non-TAMU students are allowed to sign up for equivalent classes at their home university. The TAMU faculty members report the grades to the student’s home department.

Lessons learned

The Belgium Study Abroad program is now in its ninth year. In the eight years of the program so far, the most satisfying aspect has been observing the cultural development of the students. Many of the students had never been outside of the United States before. One student told me, “I had never been on a plane, on a train, or in a taxi, but today I did all three!”

The students arrive in Brussels jet-lagged and disoriented. Everything is new and different—language, money, food, transportation, and climate. However, they quickly transform into savvy international travelers. They learn to read train schedules, find food and lodging, travel to other countries, and still get back to Leuven in time for class. A key indicator of the students’ international assimilation into European culture is the fact that we have never had to help a student find the Brussels airport on the way home. By the end of the program, all have acquired the confidence and ability to get themselves home without any assistance from the faculty members.

In this age of globalization, as employers are increasingly looking for candidates with international experience, students who have participated in study abroad programs—like ours—will definitely have an advantage.

ASABE members Clyde Munster, P.E., Professor, and Cady Engler, P.E., Senior Professor, Department of Biological and Agricultural Engineering, Texas A&M University, College Station, USA; c-munster@tamu.edu and c-engler@tamu.edu.

For more information on the Belgium Study Abroad program at Texas A&M, contact Clyde Munster or visit: https://studyabroad.tamu.edu/?go=Belgium. Recruiting begins in the fall, and applications are accepted until spring.

Belgium map image © mucft | Fotolia.com.
first got interested in biological systems engineering during a six-month stay in Mali, in West Africa. I volunteered at the Koutiala Hospital for Women and Children during my gap year between high school and college. While I was in the town of Koutiala, I had a chance to accompany Anco, a Dutch solar engineer, on a day trip to a remote village, where he installed a small photovoltaic (PV) system for the local bush clinic. The simple photovoltaic system took just a day to install, but it powered a pump that gave the clinic access to clean water. The solar panels also allowed the clinic to preserve vaccines with refrigeration, which would have been impossible otherwise, since the village was off the grid.

Two simple devices, both powered by the sun, improved the lives of thousands of people who lived in the area served by that little clinic. When I left West Africa, I carried that insight with me. Seeing firsthand how closely quality of life is tied to energy access changed my mind about studying medicine. Instead, I would study renewable energy systems. Back home in Nebraska, I enrolled in the field that I thought would best allow me to do that: biological systems engineering.

In my coursework, I got to know other University of Nebraska-Lincoln (UNL) students who were also passionate about sustainable energy and who wanted to apply that technology to help developing communities around the world. I also consulted the CEO of a local nonprofit, Global Partners in Hope. With his support and encouragement, I founded the World Energy Project and recruited my colleagues at UNL to join. My father, an attorney, filed the necessary paperwork to incorporate the World Energy Project. He made sure we had the proper legal framework in place to be recognized by the state.

As a junior University of Nebraska-Lincoln student, during the summer of 2011, I traveled to Kiel, Germany, to study sustainability at the Christian-Albrechts University. Since I am captivated by renewable energy, I loved my time in Germany, which is a world leader in renewable energy technology. In particular, Germany has led the way in photovoltaic systems, both technically and politically. I especially enjoyed a visit to the Wuppertal Institute in Berlin, one of the world’s foremost think tanks on issues such as climate change, sustainable development, and energy policy. It was encouraging to see that the staff at the Wuppertal Institute is relatively young. My generation is leading the global initiative in transitioning to renewable energy!

Back in Nebraska, the World Energy Project (WEP) really took off. Over the past two years, WEP has grown to include more students from UNL as well as the University of Nebraska-Omaha, Creighton University, Metropolitan Community College, and most recently a team of students from the University of Massachusetts-Amherst. Our goals for WEP include funding the “operations side” so that a small team can run WEP full-time, and thereby we can manage more projects. We plan to continue organizing and sending teams of students out into the world. We have all had life-changing experiences while working on location, and want to extend that opportunity to other students. We are also working on community education here in Nebraska through the Omaha Public Schools (OPS). Last year, Global Partners in Hope and WEP gave presentations to dozens of OPS schools. There was even a documentary made about that effort. Meanwhile, the UMass-Amherst students are working on a similar public school campaign in the Boston area.

We believe in the power of education to impact students at home and students abroad. Not everyone has to travel to be a part of WEP. In the next few years, we hope to be on university campuses across the country and have a base established elsewhere in the world, perhaps East Africa, to engage leaders from the developing world in championing our work.

WEP exists to promote sustainable development through the design and installation of renewable energy systems. I hope to establish WEP as a permanent, on-going enterprise—so that someday I can hire myself and my co-founders as working engineers! Until then, I will continue in my role as WEP’s executive director.

ASABE member Ashley Schmidt, graduate student, University of Nebraska-Lincoln, USA; koutiala08@gmail.com.
Editor’s Note: ASABE member John Andruch III was selected by Engineers Week as ASABE’s top New Face of Engineering for 2013. With a generous grant from Deere & Company, ASABE was able to send Andruch to Washington, D.C., to participate in some of this year’s E-Week activities. Helping with ASABE’s exhibit at Discover Engineering Family Day and serving as a judge at the Future City Competition national finals gave him ample opportunity to learn about E-Week programs, meet others involved in outreach, and generally act as an ambassador for ASABE and the profession of agricultural and biological engineering. Here, Andruch reflects on his experiences and invites readers to seek ways to impact young lives.

E -week began with helping at the ASABE booth for Discover Engineering Family Day. We taught children about popcorn, and how different attributes of the kernel affect its ability to pop. I had some great experiences interacting with the kids. I asked a little girl about what she had learned in the exhibit. She was terribly shy, so much so that her mother felt compelled to mention it. I got down on my knee and talked to her about popcorn. That got her to open up a little—just like a popcorn kernel opens up! I didn’t push her to talk, but she chatted because I was listening, and I thanked her for taking the time to talk with me.

As the day progressed, the engineer in me kicked into action. I saw that the weak link in ASABE’s hugely popular display was going to be the popcorn machine keeping up with demand. I felt compelled to step in and make it more productive. I think the drive to make things better is the heart of a “real” engineer—always ready to dive in and fix something. But we don’t always take time to explain the “why” and to promote our profession. I encourage all engineers reading this to take that time, volunteer within your profession, and make it a point to show your work to a younger person—something that will spark questions that a child wants answered.

When I was in school, several working engineers took time to show me what they did. I job-shadowed in three different fields: chemical, civil, and mechanical engineering. They let me tag along for a day and see what their jobs were really like. Those were great experiences, and if not for my farming background, I would have become a mechanical engineer. What about kids today who know they want to be engineers but have never heard of agricultural and biological engineering? Will they pursue another profession instead, maybe a profession that they don’t really have the heart for? Addressing these questions is our greatest professional challenge.

In the larger field of engineering, there is a debate raging about an impending “engineering gap,” while at the same time the number of farmers, and therefore the number of children who are exposed to agriculture, is shrinking. Where will the next generation of well-rounded agricultural and biological engineers come from? “Well-rounded” is the operative term here. Taking the time to show the next generation of agricultural and biological engineers how diverse, varied, and well-rounded our profession is—that’s the key. From my E-Week experience, I have a renewed sense of duty to that next generation.

My farming background helped influence me to be an agricultural engineer. For those in any of the related fields—agricultural systems, environmental engineering, biological engineering, machine systems engineering, remember the spark that first got you interested in your field? Share it with a child! Enthusiasm is contagious. Give a hands-on presentation at your local high school, let interested students job-shadow you, get involved in a school science fair, or be a mentor for a Future City team.

While in Washington, I took time to visit the Library of Congress, the largest library in the world—the building itself is a work of art. Carved into the stone stairs at the main entrance are 16 cherubs. They represent the “noble professions” at the time the library was built. There is no engineer among the carvings, but there is a farmer. There will always be a farmer.

ASABE member John Andruch III, Tracked Feller Buncher Engineer, Caterpillar Forest Products, LaGrange, Ga., USA; Andruch_John_P@cat.com.

Texas A&M food engineers make advances in food safety

**In Brief:** You might not see bugs and bacteria on fresh fruit and vegetables, but they’re there. Texas A&M food engineers are experimenting with new technologies to eliminate these threats to keep produce safe and healthy.

Food engineering researchers at Texas A&M University are perfecting several methods to ensure the safety of fresh produce, including electron beam, or e-beam, irradiation, which kills disease-causing organisms that survive conventional decontamination methods, as well as several advanced packaging techniques.

The Centers for Disease Control says that food irradiation holds great potential for preventing many foodborne diseases in meat, poultry, fresh produce, and other foods without harming the nutritional value of food or making it hazardous to human health. “Irradiation kills bacteria without damaging produce or making the product unsafe to eat,” says ASABE member Rosana Moreira, P.E., food engineer and professor in the Department of Biological and Agricultural Engineering.

Moreira, along with ASABE members Elena Castell-Perez, P.E., and Carmen Gomes are working to calculate the best methods of using electron beam irradiation to eliminate dangerous bacteria and maintain the nutritional content of fresh produce. Applying ionizing radiation to food was introduced more than 100 years ago. Today, food processors in 50 countries rely on irradiation to make food safer, but it has fallen out of favor in the United States—largely the result of consumer fear and lack of understanding of “radiation” and its diverse applications. “The idea of eating food that has been irradiated concerns some consumers,” Moreira says, “But irradiated food is completely safe, and may even be better than food that has not been irradiated.”

Almost all fresh fruits and vegetables sold commercially in the United States are treated with chemicals before reaching grocery stores. Although beneficial for eliminating many contaminants, some of these chemicals have been found to leave residues that can become harmful once in the consumer’s hands—such as when cooking fruits and vegetables at high temperatures, which is common in home canning. And chemical treatments only reach bacteria on the surface of produce, and may not eliminate all of these surface bacteria.

Gomes says food irradiation has several advantages over chemical decontamination methods. “When we treat produce with chemicals, we just treat the surface of the produce,” Gomes says, “Irradiation penetrates the product and helps decontaminate it from harmful bacteria that may have found their way inside.” Irradiation also eliminates problems associated with other food safety treatments, such as nutrient degradation or changes in the produce’s color, texture, and flavor.

The researchers are now working to determine precisely how much irradiation is enough. “Quality is very important,”

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With an E-beam conveyor, Carmen Gomes searches for new ways to keep fruits and vegetables safer and fresher for longer. Methods include irradiating the produce with a burst of energy and novel packaging.
Castell-Perez says, “We want to maintain everything good—vitamins, color, shelf life—but get rid of things like Salmonella.” Computed tomography (CT) scans can map produce to calculate the dosimetry (the absorbed dose of ionizing radiation) for certain fruits and vegetables. Using computer simulation, scans can cut a cantaloupe, for example, into thousands of layers to create a model that enables the researchers to calculate the smallest dose of radiation needed to reach every part of the product.

However, because no fruit or vegetable is exactly alike, mapping out a standardized dose is a sizable challenge. “First, as engineers, we need to understand how to make the energy distribution uniform,” Moreira says. “Once we understand the uniformity, which is a big issue, we need to know how much energy to put into the fruit or vegetable to make sure there is no degradation of quality.”

The researchers’ work has shown that irradiation can slow down ripening and spoilage to extend shelf life. The team is also exploring how irradiation can actually increase the nutritional value of fruits that are high in antioxidants, such as blueberries.

Developing new and improved packaging for produce is another major area of focus for Castell-Perez, Moreira, and Gomes. The team is working to improve the sheet plastic that wraps much of the fresh produce found in supermarkets by adding a combination of techniques—radiation physics and biology, food science, packaging materials, and computer methods—to enable plastic wrap to fight off unwanted germs.

Such a comprehensive approach to enhancing plastic packaging for food safety has not been done in quite this way before. “The idea to improve the effectiveness of packaging came to us when we first irradiated a bag of spinach,” Castell-Perez says. “The applied dose was too much for a food sensitive to radiation. The treatment eliminated the pathogens, but it also destroyed the food. So we thought, can the package be ‘active’ and help maintain the quality as well as the safety of the spinach?”

To do this, the researchers apply natural enzymes and natural extracts, such as cinnamon, garlic, clove, thyme, and rosemary, to plastic films used for food packaging. These spices have been shown to be powerful antimicrobial substances, Gomes says. A major challenge is making sure the spice used for protection does just that, without leaving anything behind, like its flavor. For example, while garlic may enhance the bacteria-fighting ability of plastic packaging, garlic’s distinctive flavor would not be a good addition to berries.

The extracts are embedded in an FDA-approved plastic film coating and then mixed with a natural polymer. “We use microencapsulation,” Gomes says. “We coat the compound with another substance, making a capsule, and when it’s in contact with the food, the compound migrates to the food.” This effect must be carefully designed so that the exact amount of the extract at the desired rate is released into the food.

In addition to experiments with natural extracts, the researchers are evaluating the feasibility of using plastic film packaging in combination with certain gases, such as oxygen, combinations of nitrogen and oxygen, and ozone. When a bag of spinach is irradiated, the air inside the bag is also exposed to ionizing radiation. This creates active radicals that are ready to react with another compound, such as ozone, hydroxide ions, and even carbon dioxide. The reactions between these compounds are harmless to the consumer, but they destroy unwanted bacteria. Combining antimicrobial packaging with a modified atmosphere could increase the radiation sensitivity of the pathogen in question, thus requiring a smaller dose while ensuring wholesome, safe, and long-lasting produce. “When you talk about using gases in combination with irradiation, there is a synergistic effect. The irradiation converts the gas into some compounds that will be antimicrobial,” Moreira says.

The Texas A&M researchers are working toward a common goal: improving packaging safety. As they work through these challenges, they’re also fueling innovations for attacking the challenge from all directions. “Irradiation and better packaging do not excuse dirty or mishandled produce,” Castell-Perez says. “But these are preventive steps, and we are collecting scientific data that proves this point.”

For more information, contact Science Writer/Editorial Manager, Lesley Kroewald; lesleyk@tamu.edu. Photos courtesy of Texas A&M Engineering.
First-of-its-kind wastewater treatment system saves turkey processor millions, protects environment

In Brief: Over $10 million has been saved by an Ohio meat processor by treating its wastewater in a new way. A sand bioreactor system was developed based on research conducted at The Ohio State University. This university/industry partnership has saved jobs, money, and is protecting the environment with effluents that exceed the quality of conventional treatment systems.

Whitewater Processing Co. slaughters and processes 6,000 to 8,000 turkeys on a normal day, producing about 1.13 to 1.36 million kg (2.5 to 3 million lb) of turkey meat in an average month. The Kopp family has run the business since the 1930s, and with 110 employees, they wanted to stay in business. However, in the 1990s, environmental concerns about the 549,000 L (145,000 gal) of wastewater that the business produces each day nearly forced the business to close.

Today, with a first-of-its-kind treatment system, designed by ASABE member Karen Mancl, an environmental scientist and Ohio State University Extension water quality specialist, the situation has improved. Although the costs have been considerable—about $1 million to build the wastewater treatment system plus an estimated $1.8 million to operate and maintain it over the next 20 years—the Kopp family figures the business will save at least $10 million over the next-best alternative. “It’s working very well, and we’re very excited about it,” said Ryan Kopp, project manager.

In the late 1990s, Whitewater began working with Mancl after the Ohio Environmental Protection Agency grew concerned about the company’s open-lagoon wastewater treatment system, since the Whitewater River is very close to the facility. “It’s a beautiful river, and we definitely wanted to make sure it’s protected,” said Mancl, who is also a professor in Ohio State’s College of Food, Agricultural, and Environmental Sciences and a scientist with the college’s research arm, the Ohio Agricultural Research and Development Center.

Mancl had just finished a study on using a sand bioreactor system to treat wastewater from a cheese-making plant. Although that company didn’t follow through with the system, Mancl’s studies showed that sand bioreactors provide an effective way to treat high-fat, high-organic-matter wastewater at a relatively low cost.

Whitewater’s options were limited. The Ohio EPA first suggested that the business connect to the municipal wastewater treatment plant in the city of Harrison. However, the company would need to pretreat its wastewater to remove pollutants that the municipal system wasn’t designed to handle, and it would have to pay a premium for use of the municipal plant. The total cost for construction of the pretreatment facility and use of the municipal treatment plant over 20 years was estimated at $12.5 million.

“It would likely have been even more,” Kopp said. “When we first looked at that option, they gave us some estimates for future increases in treatment costs. So far, the actual increases have been more than they projected.”

In 2001, Whitewater began funding research in Mancl’s lab to determine if bioreactors would work for the type of wastewater that its facility generated. That funding continued year after year as Mancl, graduate students, and post-doctoral researchers ran test after test. “With all of Karen’s work, we knew the system would work,” Kopp said. “It was just a matter of scaling up to what we needed for commercial use.”

With a bioreactor system, the wastewater is first screened to remove as much of the suspended solids as possible before it flows through beds of sand and gravel. Microbes populate the surfaces of the sand grains and gravel, and they break down the organic matter, removing it from the water. The treated water runs clear.

Biochemical oxygen demand (BOD) is the standard that regulators use to measure water pollution. Before treatment, the effluent at Whitewater has a BOD of over 800 mg L\(^{-1}\). Normal sewage has a BOD of about 200 mg L\(^{-1}\). After treatment, the BOD of the wastewater is less than 5 mg L\(^{-1}\), and it can be released directly into the Whitewater River with the Ohio EPA’s blessing.
Whitewater’s bioreactor system covers 1.6 ha (4 acres) of land adjacent to the facility. “It looks like a park,” Mancl said. “All you see are 12 large rectangles of gravel, with grass around them. Under the gravel, pipes carry the wastewater and spray it, underground, onto the sand. It’s quiet, there’s no odor, and even though most wastewater treatment plants aren’t necessarily something you want to look at, it’s not ugly. They plan to add trees to make it even more attractive.”

One of the challenges with the system is that operators must make sure the bioreactor doesn’t get overwhelmed and become clogged. “If a sand filter gets clogged,” Mancl said, “you need to turn that filter off and let it rest and send the wastewater to another filter. Meanwhile, the microbes consume the excess wastes in the clogged filter and unclog it. That process takes about four months.”

“The typical loading rate for a bioreactor system is about 61 L per m2 (1.5 gal per ft2) per day,” she said. “We loaded our lab system up with 244 L per m2 (6 gal per ft2) per day, and it took a year to clog the sand. Then we let it rest, and after four months, it worked like a brand new filter. You have to let the microbes work to consume the extra organic matter that clogged the sand.”

The amount of wastewater generated at Whitewater requires the use of eight bioreactor cells at a time. Whitewater is building twelve cells to have the backups needed to let filters rest. Eight cells are currently online and in operation.

Another concern with wastewater is the amount of ammonia it contains. “There’s a different group of microbes that consume ammonia, and they grow more slowly,” Mancl said. “We’re working with Whitewater to track that now as the new system is starting up. It’s definitely improving, but for now they’re using a backup chemical ammonia-removal system that reduces the ammonia to practically nothing. The system also has some standby lagoons, so if for some reason they’re not able to discharge into the stream, they can hold the water in a lagoon.”

Yet another concern regarding wastewater is its level of nutrients, such as phosphorus and nitrogen. Although there are no current limits on nutrients in treated wastewater, such regulations are definitely on the horizon. “We’re not just waiting to see what will happen,” Mancl said, “we’re trying to get ahead.” In research funded by the Ohio Water Development Authority, one of Mancl’s graduate students is using Whitewater’s treated wastewater to irrigate greenhouse plants, essentially recycling the nutrients to fertilize horticultural crops. If the results are positive, Mancl and Kopp can envision a day when greenhouses could be built on top of the bioreactors or on adjacent land.

Another challenge is the maintenance of the pipes, pumps, valves, and controls that distribute the wastewater. “Distributing wastewater over such a large area in a simple way really hasn’t been done before,” Mancl said. “The technology and the types of valves that we’re using are new. It’s a new approach.”

Both Kopp and Mancl believe that such a system could work well at other food-related processing facilities. “I think we were the perfect place to build the first one,” Kopp said. “There’s a gravel pit right behind the facility. The land we’re using was previously a junk yard that we had to clean up. Everything was right here. If you’re farther away from gravel or in a setting without acreage, it would be more of a challenge.”

Sizing the sand bioreactor was a big question, and Mancl’s research helped the Ohio EPA understand how big the system needed to be. Since most wastewater treatment systems need full redundancy to provide reserve capacity in case of short-term large flows or mechanical problems, the EPA initially told Whitewater that it needed to build 16 bioreactor cells instead of the 12 they had planned.

However, Mancl held an OSU Extension workshop on the sand bioreactor system for EPA engineers, where she presented all of the research on this new technology. The information gave the regulators the assurance that this different type of system provided the safeguards necessary to protect Ohio’s environment. By reducing the number of cells from 16 to 12, Whitewater saved $250,000 in construction costs. “That’s the kind of savings that university research can provide,” Mancl said.

For more information, contact Martha Filipic, OSU CFAES Technical Writer, filipic.3@osu.edu; Karen Mancl, mancl.1@osu.edu; or Ryan Kopp, ryan.kopp@gmail.com.

Workers spread fine sand in a bioreactor cell at Whitewater Processing Co. The sand is the heart of the system where microbes populate the surface of the sand grains to break down and remove pollutants from the water. Photo courtesy of Ryan Kopp.
New tool gets to the root of the matter

In Brief: A new tool developed by ARS and Cornell University researchers is giving scientists faster and more detailed looks at three-dimensional root architecture as it develops.

USDA-ARS scientist Leon V. Kochian and his colleague at Cornell University have developed a new tool for studying how roots take shape in the soil. The three-dimensional imaging system and software package, developed by Kochian and Randy T. Clark, allows scientists to collect data on root systems faster than ever before and to study root architecture in unprecedented detail. Root systems play a critical role in crop health, and like any structure, they have their own architecture.

Kochian is director of the ARS Robert W. Holley Center for Agriculture and Health in Ithaca, N. Y., and Clark is a doctoral student in his laboratory. This research supports the USDA’s priority of promoting international food security.

Called RootReader3D, the system gives scientists the ability to analyze root structures and growth patterns, to compare one root system with another, and to genetically map and explore traits that give plant roots the capacity to reach into the soil and collect water, phosphorous, and other nutrients.

Previous systems allowed scientists to take three-dimensional images of root systems growing in gels, but those systems required up to an hour to collect enough data for a single three-dimensional image. With the RootReader3D system, scientists can produce images of more than 100 root systems a day, providing the information needed to conduct genetic mapping experiments.

To test their system, Kochian and Clark grew two very different varieties of rice, Azucena and IR64, in transparent gels and tracked root growth by imaging the plants and their roots for ten days. The researchers found that they were able to delineate greater detail in the two root systems than had been observed before. Azucena had deeper roots than its irrigated cousin IR64, and the two root systems were significantly different in how the root volume was distributed and in the vertical position of the center mass of the root system.

The researchers hope that the data they collect using RootReader3D will help scientists identify genes controlling important root developmental traits. The goal is to help plant breeders develop varieties of rice and other crops with roots that make them better equipped to handle drought, heat, poor soil quality, and other stress factors in a changing world.

For more information contact Dennis O’Brien, USDA-ARS Public Affairs Specialist; dennis.obrien@ars.usda.gov. Photo by Randy Clark, courtesy of USDA-ARS.

Azucena rice, an upland cultivated variety, growing in a growth cylinder system used to capture the dynamic growth of root systems in three dimensions.
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2013 ASABE International Meeting  
July 21 - 24, 2013  
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July 22, 2013  
GENERAL SESSION KEYNOTE

Helmi Ansari  
PepsiCo Foods Canada

July 23, 2013  
BIOENERGY DAY KEYNOTE

Dr. Sonny Ramaswamy  
Director of the USDA National Institute of Food and Agriculture

Meeting Highlights

• More than 1,000 Technical and Poster Presentations  
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8:00 am-6:00 pm
ASABE Annual International Meeting
Kansas City, Missouri

Visit www.asabemeetings.org

Keynote address: Dr. Sonny Ramaswamy
Director, USDA National Institute of Food and Agriculture

PANEL 1 (9:45-11:45 am)
Supply of High Tonnage Feedstock
Panel members: Sam Tagore, U.S. DOE (moderator), Kevin Comer, FDCE; Maynard Herron, AGCO; Steve Taylor, Auburn University; K. C. Ting, University of Illinois at Urbana-Champaign.

Objective: To review recently developed innovative equipment and systems to overcome barriers in delivering high-tonnage biomass for cellulosic biofuel production. In 2009, the U.S. Department of Energy (USDOE) announced the selection of five projects to develop supply systems to handle and deliver high-tonnage biomass feedstocks for cellulosic biofuel production. These five projects are nearing completion. ASABE has invited the lead investigators of these logistics projects to participate in a panel to discuss innovative equipment and systems that these projects have developed.

PANEL 2 (1:30-4:00 pm)
Critical Needs in Biorefining Research and Development
Panel members: Ray Huhnke, Oklahoma State University (moderator); Ram Gupta, NSF; Jim Rekoske, UOP; Quang Nguyen, Abengoa; Steve Thomas, DOE BETO; Tim Rials, University of Tennessee; Ralph Cavalieri, Washington State University.

Objective: To highlight the collective roles and responsibilities of research institutions, federal agencies, and industries in addressing the R&D hurdles that biorefineries must overcome. Members of this panel will explore opportunities and activities from basic to applied research in feedstock development, production, supply, and conversion.

POSTER SESSION (4:30-6:00 pm)
New Frontiers in Bioenergy


Academic Partners: University of Georgia; Iowa State University; Cornell University; Oklahoma State University; Pennsylvania State University; South Dakota State University; University of British Columbia; Forest Concepts, LLC; University of Nebraska-Lincoln; Michigan State University; Great Lakes Bioenergy Research Center at Michigan State University in collaboration with University of Wisconsin, Madison; Mississippi State University; West Virginia University.

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Announcing the

AGRICULTURAL AND BIOLOGICAL ENGINEERING

Visual Challenge 3

ENTRY DEADLINE: JULY 1, 2013

Engineers are proficient in science and technology, and have to be a good communicators as well. In fact, engineers have a unique responsibility to communicate technical concepts to a larger audience. Traditionally, that is done that with words and numbers. Increasingly, however, communication in images is flourishing.

Visual imagination combined with technical skill can produce astonishing—and deeply informative—images. To call attention to and celebrate the visual aspects of agricultural and biological engineering, Resource announces the third annual Agricultural and Biological Engineering Visual Challenge.

The theme is visual communication of agricultural and biological engineering, and the Challenge is open to all: members, non-members, engineers, and non-engineers. To participate, submit one or more entries in any/all of three categories: photographs/captured images, illustrations/drawings, and informational/explanatory graphics.

Entries will be judged on their visual appeal, clarity, or explanatory power (according to the entry category) as well as their relevance to the Challenge theme. Use your entry to convey the beauty and meaning of your work, your research developments, and your Society division. All entries should be original work.

The Challenge is an opportunity to be creative and to show those outside the ABE field: “This is what we do.” Submit your entry as an e-mail attachment in jpg format (300 dpi or higher) to Sue Mitrovich, Resource managing editor (mitro@asabe.org). Enter “Visual Challenge” in the subject line, and include your full name, professional affiliation, contact information, and a title with a brief description of your entry in your message. If necessary, include a source credit and an assurance that permission has been granted to submit, and possibly reprint, the entry. Multiple entries are welcome.

The winning entries will be selected by Resource staff and published in the September/October 2013 issue of Resource.
The Membership Has Spoken

Do Not Support the BS+30 Requirement for PE

In the January/February issue of Resource, ASABE President Tony Kajewski asked you to consider and provide feedback on a very important issue concerning a proposed new requirement for those wishing to sit for the Professional Engineers (PE) exam. ASABE has the opportunity to express to NCEES (the governing body that establishes the requirements for licensing PEs) an opinion on this additional requirement. Your feedback helped determine ASABE’s position on this issue.

First, let’s revisit the issue at hand. Currently, the NCEES model specifies that an aspiring PE must meet the following requirements to sit for the exam: hold a bachelor’s degree in engineering from an ABET-accredited program, have at least four years of appropriate work experience, have passed the FE exam, and possess a clean disciplinary record. The proposed change to this model would also require a PE candidate to hold a master’s degree or an equivalent of 30 credit hours of graduate coursework in engineering. This proposed change would go into effect in 2020 at the earliest.

To garner feedback, a simple survey was created asking members whether or not ASABE should support this additional requirement or offer no opinion. Comments were encouraged as well. A total of 215 responded, with 121 providing comment. We were overwhelmed at the response rate and thank you for your candid words. To read all the comments, visit: www.asabe.org/media/136240/bs30all-comments3-13.pdf.

The results are in, and the direction is crystal clear: ASABE should not support this proposed change. Here are the actual response numbers: 89.8 percent against, 8.8 percent for, and 1.4 percent neutral.

One member summed it up as follows: “Additional class time does not add to an engineer’s experience. For many, the appropriate path would be to enter the job market sooner, and gain the valuable hands-on experience needed to become a good engineer.” This was a common theme in much of the feedback.

Others were concerned with potential barriers that the proposal might create to taking the exam. The following comment captures the general sentiment: “This proposal would have a serious adverse effect on the biological and agricultural engineering profession by reducing the number of our engineers who sit for the PE exam. Our exam would likely disappear in the wake of the BS+30 proposal being implemented.”

Many thanks to Jay Harmon, P.E., Dan Thomas, P.E., and Maynard Herron, P.E., for explaining the issue and providing their positions in the January/February issue of Resource, and for the hundreds of members who took the time to offer their feedback.

Mark Crossley, ASABE Director of Membership, St. Joseph, Mich., USA; crossley@asabe.org.

Gears image © Imrich Farkas | Dreamstime.com.
ASABE FOUNDATION CELEBRATION DINNER
The American Jazz Museum
Tuesday, July 23, buses leaving at 7:15 pm
$100 includes dinner, entertainment, and transportation

Located in the historic Jazz District of Kansas City, the museum houses Charlie Parker’s saxophone, one of Louis Armstrong’s trumpets, Ella Fitzgerald’s sequined gown, and memorabilia from Duke Ellington. Enjoy a sumptuous meal of Kansas City’s famous Jack Stack Barbeque and the historic exhibits, which bring American jazz to life.

FOUNDATION SILENT AUCTION REMINDER
Items for the Annual ASABE Foundation Silent Auction are now being collected. At past auctions, beautiful handmade quilts, wine, tools, jewelry, household appliances, and vacation timeshares have been up for bid. The possibilities are endless. Check the suggestion and donor pages online for further details (www.asabe.org/foundation/activities.aspx). Contact Linda Young, young@asabe.org or 269-932-7006, with any questions.

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This Guide to Consultants is presented as a service to people interested in agricultural/biological engineering assistance. This listing is not an offer or advertisement to provide engineering services in any state or jurisdiction where the professional engineer or professional engineering firm is not registered/licensed. All information was provided by the listed consultant. The American Society of Agricultural and Biological Engineers (ASABE) assumes no responsibility for the validity of the qualifications listed or the consulting services performed.

Listings for both registered professional engineers and consultants who are not registered engineers are included. In the United States the registration/licensing of professional engineers is vested in the states/territories. Administration of the relevant laws governing the practice of engineering is assigned to engineering boards. The primary role of these regulatory boards is to protect the life, health, property, and welfare of the public and to ensure that unqualified individuals do not practice engineering. Many other countries also have laws and regulations pertaining to the practice of engineering. When selecting a consultant, it is recommended that any jurisdictional registration/licensing requirements be identified for specific services.

In the following listings, the date after the specialty description is the professional engineer’s initial registration date. The state(s) or country in which the consultant is registered follows the date. The consultant’s availability is given on the next line, including geographic area of service.

Indication of registration in a single state does not imply that a professional engineer cannot be registered in other states. Most state engineering registration laws and rules are patterned after guidelines prepared by the National Council of Examiners for Engineering and Surveying, P.O. Box 1686, Clemson, SC 29633, USA. Most states have laws that permit a professional engineer to become registered in other states, either temporarily or permanently, without re-examination. Consideration of the consultant should be on the basis of the consultant’s qualifications and not on where registered, because many consultants can obtain registration in other states or jurisdictions.

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Initial date of registration 1974; MI, WI
Available part-time; Domestic and International

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Initial date of registration 1993; SK (Canada)
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Richard W. Job and Associates, LLC
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816-223-5927
rich.wjob@sbcglobal.net

Managing the product design and development process; product safety evaluation process; standards application and compliance.

Initial date of registration 1985; WI
Available part-time; Domestic and International

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Initial date of registration 1984; LA, GA, FL, KS, AZ, IA, VA, TX, KY, OH, SC, NC, TN
Available full-time; Domestic and International

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Provider of engineering, design, prototype build, and testing for various industries. Work done in agricultural and construction equipment, food processing, specialty machines, test machines, weld fixtures and tooling for prototypes and manufacturing, CMM measurement, and data acquisition. Experience in all phases of a project: concept, design, FE, build, testing, product verification. ProE, AutoCAD, Inventor, SolidWorks.

Initial date of registration 2007; IA
Available full-time; Domestic and International

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Agricultural, Chemical, Mechanical, Forensic Engineers. Michigan, Idaho, Oregon offices. Expertise Areas: Hay, grain, harvesting, storage, dairy, food processing safety; tractor, implement, chemical safety; farm, accident reconstruction; equine/cattle accidents; slips, falls – vehicle, ladder; operator manuals, warning labels; OSHA compliance; irrigation, hydroelectric, wind, renewable energy systems.

Initial date of registration; ID 1999, OH 1968
Available full-time; Domestic

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Provider of engineering, design, prototype build, and testing for various industries. Work done in agricultural and construction equipment, food processing, specialty machines, test machines, weld fixtures and tooling for prototypes and manufacturing, CMM measurement, and data acquisition. Experience in all phases of a project: concept, design, FE, build, testing, product verification. ProE, AutoCAD, Inventor, SolidWorks.

Initial date of registration 2007; IA
Available full-time; Domestic and International

Available full-time; Domestic and International

Available part-time; Domestic and International

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Maurer-Stutz, Inc.
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Consulting, evaluation, planning, and design services for livestock and poultry production facilities including expansion, site development, feasibility studies, renovation, ventilation and heating, environmental monitoring, product development, construction observation, manure handling/treatment/permitting, nutrient management, equipment/material specifications and earthwork quantities. NRCS project experience. Experience includes beef, dairy, swine, horses, and poultry facilities.
Initial date of registration 2010; IL, IA, MO, WV, HI
Available full-time; Domestic and International

Brian L. Roy, P.E.
Royal Consulting Services, Inc.
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407-831-3095
Fax: 407-831-5095
RoyBL@royalconsulting.com
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Agricultural, water resources, and environmental engineering services, including agricultural planning and layout, environmental and consumptive use permitting, nutrient management, alternative water supply and reuse systems, irrigation and drainage design, ground and surface water modeling, wetlands coordination, conservation planning, effluent disposal systems, CAD and GIS, and construction oversight and bidding services.
Initial date of registration 1992; FL, PA, NY, NC, TX, LA
Available full-time; Domestic and International

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Denver, PA 17517, USA
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www.timbertecheng.com
Consulting engineering and design services for timber frame and light wood constructed buildings. Design of manure containment structures and agricultural engineering. Concrete, masonry, and steel design. Also, building code review and computer aided drafting services.
Initial date of registration 1989; PA, CT, DE, FL, GA, IN, IA, KY, MA, MI, MN, MO, MS, MD, NJ, NY, NC, OH, SC, TN, UT, VA, WI, WV, WY
Available full-time; Domestic

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Initial date of registration 1993; IA, IL, MO, NE
Available full-time; Domestic

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Initial date of registration 1979; CA, MS
Available full-time; Domestic and International

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Cell: 507-254-5018
Fax: 507-282-3100
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www.stantec.com
Consulting engineering services for agricultural waste handling and storage, manure and nutrient management, permitting, site design, drainage, food processing waste and wastewater treatment, egg production wastewater treatment, odor control, biofiltration, planning, design, construction observation, construction management, spray irrigation design, and structure design. NRCS project experience.
Initial date of registration 1986; IA, MN, NE, WI
Available full-time; Domestic and International

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Consultation on agricultural experiment stations, commercial and private facilities housing livestock and poultry or storing grain and seed. Services include designs, plans, and specifications for the general, structural, mechanical, and electrical portions of the projects, including site development, utilities, and waste handling.
Initial date of registration 1977; IA, OK, IL, KS, OH, ID, CO, MO, MN, MS, WI, NC, KY, NE, PA, SD, IN, MI, NJ, AR, MD, TN, AL, GA, VA
Available full-time; Domestic and International
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Nellie Brown is a certified industrial hygienist, providing health and safety training and technical assistance. She developed a process failure and hazard assessment protocol for anaerobic digesters used for processing manure and generating electricity on dairy farms. Nellie serves on an ASABE committee developing a standard on manure pit ventilation.
Available part-time

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WHAT A CONSULTING ENGINEER CAN DO FOR YOU

Because of their broad educational background, consulting agricultural engineers are a source of information on a wide variety of topics and can provide help with diverse technical problems. The design and management services agricultural engineers provide can be invaluable to small businesses without their own engineering departments, to agricultural producers and similar enterprises, and to large businesses or governmental agencies that want to supplement their in-house engineering departments. Consultants also can provide service to lending institutions, law firms, local units of government and planning boards, or to individuals that need expert witnesses or technical analysis.

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What Expertise Does a Consulting Agricultural Engineer Have?
Agricultural engineers have a diverse educational background that makes them knowledgeable about many subjects; additionally, they usually focus their expertise on one of the following areas:

- Aquaculture
- Biological Applications
- Energy
- Environmental Quality
- Food and Food Processing
- Forestry
- Information and Electrical Technologies
- Power and Machinery
- Safety
- Soil and Water Resources
- Structures and Environment

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CODE OF ETHICS OF ENGINEERS

The Fundamental Code of Principles
Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:
I. using their knowledge and skill for the enhancement of human welfare;
II. being honest and impartial, and serving with fidelity the public, their employers and clients;
III. striving to increase the competence and prestige of the engineering profession; and
IV. supporting the professional and technical societies of their disciplines.

The Fundamental Canons
1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.