

International Programs in Agriculture



IPIA

Annual Highlights
2008–2009

Message from the Director

“Discovery to Delivery” is one of the goals of the Purdue University 2008–2014 strategic plan. This concept is a natural fit for the College of Agriculture and especially for International Programs in Agriculture. Two of the best examples of this are the two Purdue Agriculture World Food Prize winners: Gebisa Ejeta, Agronomy, and Phil Nelson, Food Science. Ejeta bridged the gap between biochemistry and the seed industry to create sorghum varieties resistant to the parasitic weed *Striga*. Nelson developed aseptic packaging to reduce losses and costs in food processing.



Gebisa Ejeta, the 2009 World Food Prize recipient

As director of Purdue International Programs in Agriculture (IPIA) it is part of my job to help nurture the third, fourth, and fifth Purdue World Food Prize winners. In Purdue Agriculture we start with the hiring process. In the interview process for new faculty members, we emphasize that we expect faculty members to have international impact. In IPIA we help find the resources to make the international learning, discovery, and engagement possible. In addition, we help faculty manage those resources, allowing faculty members to focus on their science. IPIA helps with the travel arrangements, visas, and complications of shipping scientific equipment and samples.

Another key IPIA responsibility is helping Purdue College of Agriculture faculty and students find the right collaborators for their international activities. No department, college, or university has all the expertise to address the challenges faced by our world. We partner with the centers of the Consultative Group for International Agricultural Research (CGIAR) and national agriculture education, research, and extension systems worldwide. We partner with a wide range of nonprofit organizations, some faith-based and others secular. We also work with for-profit businesses in the United States and in other parts of the world.

The 2008–2009 Highlights is a brief summary of International Programs in Agriculture activity over the past year. Please contact us or the departments if you have any questions or comments.

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OFFICE CONTACTS

News from IPIA

While IPIA continues with its Mission, we have had some changes in the staff providing the services. We bid a fond farewell to Kira Everhart-Valentin who, along with her husband Luc and son Léonce, moved to Kansas for their new venture in farming; and to Corey Kujawa who left to pursue her bachelor's degree full-time. James Murren joined our office as the new International Extension Program Coordinator. Katy Ibrahim, our longest tenure employee, has taken over management of the ever-growing Afghanistan programs; and Heather Fabries was hired to fill the PICS project assistant position vacated by Katy. Lonni Kucik continues working halftime, but moved off of the Advancing Afghan Agriculture Alliance (A4) project. As assistant to the director, her duties now include coordinating the GLOBE project in Kenya, the Mali Training Program, and other special projects. Some changes also occurred with our A4 staff in Afghanistan. Ann Sieges, University Development Specialist in Kabul, resigned in July and Thomas Bolles was hired to replace her in late August.

Study Abroad

In 2008–9, more than 28 percent of the College of Agriculture's (COA) undergraduates have participated in a study abroad program prior to receiving their baccalaureate—remaining the highest percentage of all colleges or schools at Purdue. Students traveled to all parts of the world and studied on every continent except Antarctica. Two courses were offered for the first time: “China: Globalization and the U.S.-China Economic Interactions” led by Holly Wang and Freddie Barnard, Department of Agricultural Economics and “Costa Rica: Sustainable Agriculture Production in the Tropics: An Integrated Approach,” led by Lori Unruh Snyder, Department of Agronomy, in cooperation with the University of Florida. John (Barney) Dunning, Department of Forestry and Natural Resources, led a group of students to Turkey—a new destination—to study natural resource issues from the Mediterranean to the Black Sea. This was a joint course with the Swedish University of Agricultural Sciences and North Carolina State University.

IPIA welcomed 16 international exchange students from our partner universities through arrangements that enable Purdue students to study at their home universities. Students came from Sweden, Denmark, Austria, The Netherlands, Australia, and Japan to study at Purdue.



Eight international agriculture ambassadors represent IPIA for 2009–10. Top left to right: James Sibray, Jessica Gilson Bottom left to right: Ben Kloc, Kali Smith, Sasha Broadstone, Chelsea Scheidler, Carissa McCay, and Keith Hoeing.

Thanks to the generosity of our supporters, scholarships and grants totaling \$16,000 were awarded through IPIA to agriculture students who participated in a long-term program (eight weeks or longer) in 2008–9.

The first class of international agriculture ambassadors will begin a new chapter for IPIA. The eight students selected will provide assistance to IPIA by giving campus tours to international visitors, promoting study abroad in the classroom and at fairs, giving presentations to interested groups off campus, and increasing global awareness in any way possible.

The 2009–10 International Agriculture Ambassadors are:

- Sasha Broadstone, Plant Biology
- Jessica Gilson, Agricultural Economics
- Keith Hoeing, Agribusiness Management
- Ben Kloc, Landscape Architecture
- Carissa McCay, Agribusiness Management
- Chelsea Scheidler, Pre-veterinary Medicine
- James Sibray, Pre-veterinary Medicine
- Kali Smith, Agricultural Economics

Extension

International Extension at Purdue had quite an involved year that included new initiatives, travel to conferences, and Extension activities abroad. Highlights include:

Globalization. In September, Purdue Extension formed the Globalization Think Tank, a group of county educators and specialists who endeavor to address globalization's impact on the state and Extension's response to that impact.

Purdue Extension and Illinois Extension collaborated on a one-day workshop designed to raise global awareness amongst educators and globalization's impact on the region. More than 40 people from the two universities participated in "Extension and the World" held in Covington, Ind., in October.

International Extension. A delegation from Purdue's Department of Youth Development and Agricultural Education (Roger Tormoehlen, Mark Tucker, Neil Knobloch, and Jiajiang Peng) and Purdue International Extension (Kira Everhart-Valentin) went on a fact-finding/relationship-building mission to China. They met with contacts at the China Agricultural University in Beijing and Northwest A&F in Yangling.

Patty Keating, Ag and Youth Development Educator (LaPorte County) went to China with Global Indiana in October, and Gonzalee Martin, Agriculture and Natural Resources Educator (Allen County) went to South Africa in October with Farmer-to-Farmer. Alan Miller, Farm Business Management Specialist in the Department of Agricultural Economics, spent 20 days working with farmers in the Bog and Dromilly communities in Jamaica to develop business plans on a Florida A&M Farmer-to-Farmer volunteer opportunity.

International Agribusiness Speakers Forum. Marcos Fava Neves, Professor of Strategy and Food Chains, School of Economics and Business, University of São Paulo at Ribeirão Preto, Brazil, addressed some of the partial truths and misinformation in media reporting over the booming food prices debate. In his lecture titled "Strategies for Solving the Food Inflation Problem," Neves argued that many studies only link biofuels to the inflation cause, while ignoring several other factors such as the growth of the world population, economic development, and income distribution. An overview of the causes was discussed and 10 strategies were proposed that policy makers, governments, and organizations could adopt to move the world towards long-term sustainability. Neves was invited to Purdue in April under the sponsorship of a grant from the USDA Cooperative State Research, Education, and Extension Service International Science Education Program.

Gardens of France. With study sites that included the King's fruit and vegetable garden at Versailles, the International Festival of Gardens at Château Chaumont sur Loire, and Monet's Garden at Giverny, the participants of Purdue Extension's *The Gardens of France 2009* travel-

study program had a truly intricate view of France's garden history. Currently in its second year, the 11-day summer program took place in July and consisted of 24 Master Gardeners and horticulture enthusiasts. They visited some of France's most famous gardens in an educational study of garden history and design. Participants came from various states, including Indiana, Pennsylvania, Kansas, and California. The program was organized and led by Mike Dana and Rosie Lerner of the Department of Horticulture and Landscape Architecture at Purdue. Kira Everhart-Valentin (previously with IPIA and Purdue Extension) served as an assistant on the program.

ACDI/VOCA Ghana ADVANCE Project. Purdue's International Programs in Agriculture (IPIA) signed an agreement with ACDI/VOCA in May to participate in the Ghana Agricultural Development and Value Chain Enhancement Program (ADVANCE). ACDI/VOCA started the four-year project in agricultural development on July 1, 2009. The project will work in several value chains to help transform Ghana's agricultural sector in the north and the south through increased competitiveness in domestic, regional and international markets. These value chains include: rice, maize, pineapple, mango, high-value vegetables, cassava, soya, sorghum, and aquaculture. Cross-cutting needs for these value chains will be in areas of ag economics, ag engineering, agronomy, and crop and soil science. Short- and long-term volunteer assignments with ADVANCE will be available to Purdue COA faculty, staff, graduate students, and Extension personnel.

Conferences. Two posters, "Cultural Competence and Global Competitiveness: Linking Indiana Agribusinesses to International Markets" and "Latino Learning Centers," were presented at the *Galaxy III Conference* in Indianapolis, Indiana, September 15-19, 2008. Celebrating the Extension System: Strengths, Diversity, and Unique Qualities was the conference theme.

The poster "Applying Research with Extension: 22 Years of Strengthening Cowpea Storage in Africa," was presented at the Association of International Agricultural and Extension Education conference in San Juan, Puerto Rico, in May.

College of Agriculture Foreign Travel. From July 1, 2008, to June 30, 2009, the College of Agriculture faculty and staff made 317 trips to 316 foreign destinations. Following is a list of the travel purposes and the corresponding numbers: Conferences and Meetings, 188; Research, 56; Off-Campus Teaching, 23; Study Abroad 17; Other, 33.

Interdisciplinary International Efforts

HED INDIA WORKSHOP

An Indo-U.S. workshop on Future Interactions between the Indian Agriculture Universities and the U.S. Higher Education Institutions was organized in Bangalore, India, by Purdue University in collaboration with Iowa State University. The two-day workshop was sponsored by Higher Education for Development (HED), Washington, D.C. Representatives from seven U.S. Universities, USDA, HED, USAID and Vice Chancellors and Deans from several Agriculture Universities and other Higher Educational Institutions in India participated in this workshop. Public-private partnerships and education were key topics of discussion. The workshop was inaugurated by the Governor of the State of Haryana, and the State Minister for Agriculture was the guest of honor. The Purdue delegation, led by Dean Jay Akridge, included Sonny Ramaswamy, Director of Agriculture Research Programs; Peter Goldsbrough, Head of the Department of Botany and Plant Pathology; Bob Joly, Head of the Department of Horticulture and Landscape Architecture; and Kashchandra Raghothama, Associate Director of IPIA. Dean Akridge addressed the conference to welcome them and briefly speak about the value of the partnerships built over the years between Indian universities and U.S. Land Grant institutions. While at the conference, the Purdue Team had the opportunity to see first-hand some of the ongoing rural development work in local villages and to visit a village adopted by University of Agriculture Sciences, Bangalore, and Purdue University. The Purdue group also had several productive discussions around possible future collaborations with Indian agriculture universities.

PURDUE IMPROVED COWPEA STORAGE (PICS)

In May 2008, the PICS project entered its second year in West Africa. Partners include the International Institute of Tropical Agriculture (IITA), World Vision International, National Institute for Agricultural Research of Niger (INRAN), National Institute for Agricultural and Environmental Research (INERA) of Burkina Faso, farmer associations, and non-government organizations.

The PICS entomology research efforts continued to focus on improving the quality and performance of the triple-layer bag technology at the farm level. On the outreach side, the PICS project trained over 500 “field technicians” who conducted village demonstrations of PICS technology. In fall 2008, PICS technology was demonstrated in 5,829 villages in Niger and 3,867 villages in Burkina Faso during the full-scale activities in both these countries.

During the initial year in Nigeria, 103 villages were part of the demonstration for the PICS project. For full-scale activities in



During the IITA/PICS Nigeria “Train the Trainer” program, a participant ties a PICS bag at the Kano history museum.

Nigeria, IITA and its partners have begun training extension agents who will conduct demonstrations in 9,900 villages during the 2009 harvest.

More than 45,000 PICS bags have been used in village demonstrations, and the technology has shown itself to be very effective. Cowpeas in all of the PICS bags were as good during demonstrations (in April and May) as they were at harvest time (October and November), except where there was occasional bag damage due to rodents.

In addition, the PICS project is broadcasting radio messages that are building awareness regarding the PICS technology. Messages are broadcast on community radios in local languages. Research by Purdue University has shown that radio is key and effective in reinforcing the PICS technology message in rural villages. The PICS technology has also used TV messages in some areas for disseminating the technology, but few rural West Africans have access to TV. The project is looking into cell phone video as an alternative way to reach rural West Africans with visual information.

The PICS project is also developing a supply chain for the PICS bags, which is providing business opportunities to bag manufacturers, distributors, and vendors in countries in West Africa. To date, the project has worked with manufacturers and distributors in Nigeria, Niger, and Burkina Faso.

The project has expanded to include Mali, Togo, and Benin, and is expected to reach around 4,000 villages in those countries. Partners in the new countries include World Vision for Mali and IITA for Benin and Togo.

RESEARCH TO SUPPORT LINKING LIVESTOCK MARKETS TO WILDLIFE CONSERVATION

Two Agricultural Economics graduate students, Vanessa DeVea and Katherine Baldwin, completed their theses, which examined two economic issues related to the well-being of pastoralist communities: 1) income diversification and conservation and 2) livestock productivity and marketing. Their theses and data result summaries were provided to North Rangeland Trust (NRT) and the Globe Foundation.

The final two Purdue students completed their Kenya research visits and data collection. Jennifer Hamilton (Vet Medicine) completed her six-week abattoir survey of community (Il Ngwesi) and ranch cattle in January–March 2009. In early May 2009, Kyle Culp (Animal Sciences) and Scott Lake (major professor, now at the Univ. of Wyoming) met with the Project Steering Committee (PSC) to discuss the best way to integrate Culp's research with Egerton student Mohammad Shibia's work. Per agreement with the PSC, Culp focused his research on evaluating the condition of the cattle. He spent three weeks doing personal interviews with the Il Ngwesi group ranch residents. From his research, a guide to cattle evaluation will be developed and submitted to NRT and Globe.

The project also includes Kenya student research. Egerton University has three students—Robert Adala and Eli Mutai in Agricultural Economics and Mohammed Shibia in Animal Sciences. A fourth student, Joel Mauya Nyamweya, University of Nairobi, School of Veterinary Medicine, was added just this year to help with the long-term success of the Abattoir Survey. Due to drought and other uncontrollable circumstances, the aforementioned students' progress toward theses completion is behind schedule. Consequently, Purdue requested and was granted a No Cost Extension until July 31, 2010.

ADVANCING AFGHAN AGRICULTURE ALLIANCE (A-4)

Purdue efforts at capacity building for Afghan agriculture have continued and expanded, and all are under or linked to Purdue's USAID Advancing Afghan Agriculture Alliance (A4). New initiatives this past year included:

- Conducting a plant diagnostic teaching workshop at Purdue to provide foundation education to junior Afghan faculty who will help the A4 develop practical education/training in plant diagnostics for Afghan students;
- Initiating development of curriculum, course materials, and teaching aids for vocational agriculture high schools, as well as teacher training for new schools in Kandahar and Helmand provinces;
- Developing and presenting a training program for National Guard Agricultural Development Teams being deployed to work as agricultural outreach specialists on one-year tours of duty in Afghanistan. We have provided training for Indiana, Tennessee, Missouri, Kentucky, Texas, and California National Guard members;

- Hosting five Afghan agriculture deans and three semester-long visiting faculty from Afghan agriculture schools;
- Conducting a plant diagnostics training workshop for students in Kabul, Afghanistan;
- Conducting an IPM workshop for staff and students at Kabul and Herat Universities;
- Conducting teaching, training, and student leadership workshops at Kabul and Herat Universities;
- Sending ten additional Afghan faculty members to the University of Agricultural Sciences in India to begin master's degree studies.

AQUAFISH CRSP

Kwamena Quagraine (AGEC/FNR), Jennifer Dennis (AGEC/HORT) and Jeanne Coulibaly, AGEC PhD student travelled to Kenya and Ghana to conduct workshops for fish farmers, fish traders, and fisheries officers on fish marketing. A total of 52 people participated, which included 15 females and 37 males. The training program covered the basics in marketing emphasizing product differentiation, pricing strategies, distribution outlets, and group marketing. Participants were also taught the need for market research to respond to consumer fish preferences. Baitfish producers were specifically trained in strategies for marketing catfish as bait for Lake Victoria fisheries, and how to access end markets at landing beaches. Baitfish traders along the lake now have access to farmed baitfish from the farmers. Jeanne Coulibaly, AGEC PhD student, also collected fish supply chain data for her research.

In Tanzania, the work led by the University of Arkansas at Pine Bluff examined the potential of local forage plants, *Leucaena leucocephala* and *Moringa oleifera*, as sources of digestible protein in fish feed. Nine diet formulations containing 40 percent protein source (soybean meal, *Moringa* leaf meal, *Leucaena* leaf meal, and mixtures of these meals) were fed to Tilapia for 90 days. The results indicate that dietary formulations consisting of only *Leucaena leucocephala* leaf meal and *Moringa oleifera* leaf meal as protein sources resulted in a slower growth rate and smaller body size compared to diets with only soybean meal as the protein source. However, when fish were fed diets in which *Leucaena leucocephala* leaf meal and *Moringa oleifera* leaf meal accounted for 25 percent of the protein sources, the growth rate and body size were comparable to fish fed only on diets in which soybean meal was the only source of protein.

In Kenya, various training programs were conducted by the host country principal investigator in technology transfer. The training programs covered catfish fry/fingerling production through artificial propagation techniques, predator control, pond construction, construction of simple hatcheries for catfish propagation, pond management, and record keeping. A total of 73 people participated in the various programs, which included 14 females and 59 males.

In Ghana, the study led by Virginia Tech is continuing to characterize pond effluents and biological and physicochemical assessment of receiving waters. The macroinvertebrate and water quality sampling (for nutrients, solids, and microbial analysis) is 70 percent complete from 12 farms, 36 ponds, and 24 receiving and reference streams and rivers in the Ashanti Region of Ghana. Best management practices are being developed for farmers, and the information will also be disseminated to researchers, government departments, and agencies.

AMA BASIS CRSP

Jerry Shively (AGEC) continues his research under a four-year grant from the Assets and Market Access (AMA) BASIS CRSP. The project, entitled Natural Capital and Poverty Reduction, is being undertaken in collaboration with colleagues at Bunda College (University of Malawi), Makerere University (Uganda) and the Center for International Forestry Research (IFPRI) and the University of Life Sciences (Norway). Researchers examine the role of natural resources in the livelihood strategies of smallholders. Two Malawian students are pursuing their master's degrees in the Department of Agricultural Economics and during the summer of 2009 they conducted extensive fieldwork at two sites in Malawi to measure impacts from the Government of Malawi's maize and tobacco fertilizer subsidy program.

INTEGRATED PEST MANAGEMENT (IPM) CRSP

Stephen Weller continued as regional coordinator for Honduras on the IPM CRSP project: IPM in Latin America and the Caribbean: Crops for Broad-based Growth and Perennial Production for Fragile Ecosystems—under the direction of the PI, Jeffery Alwang of Virginia Tech. He worked with Honduran collaborators, the Fundación Hondureña de Investigación Agropecuaria (FHIA) and Zamorano–Escuela Agrícola Panamericana (School of Tropical Agriculture). He provided assistance and expertise for research and outreach in Honduras and Central America and coordinated an internship program for Zamorano undergraduate students. During spring semester, two Zamorano student interns, Maxibel Cedeno and Jose Montemayor, came to Purdue University for one semester. They took classes and conducted research related to IPM. Weller has now served as advisor to six Zamorano undergraduate students interns. This internship program has been quite successful, as the students have become involved after graduation either working in the pest management industry or attending graduate school.

Stephen Weller was the keynote speaker at the XI Congress of Integrated Pest Management held in Tegucigalpa, Honduras, on October 8–10, 2008. The Congress organization committee was led by Zamorano, FHIA, and other foreign and national institutions working in agricultural development. Over 400

people participated (approximately 100 females and 300 males) from 14 countries of the Mesoamerican and Caribbean region.

PEANUT CRSP

Over the past year, Rick Mattes, Department of Foods and Nutrition, published one paper and has another paper and a book chapter in press:

- Mattes, R.D.; Kris-Etherton, P.M.; and Foster, G.D. "Impact of peanuts and tree nuts on body weight and healthy weight loss." *J Nutr* 2008; 138:1741S-1745S.
- Mori, A and Mattes, R.D. "Propriedades funcionais das castanhas e amêndiom: papel no risco de doenças crônicas." Costa, N.M.B. and Rosa, C.O.B. (eds). *Alimentos Funcionais* (in press).
- McKiernan, F. and Mattes, R.D. "Effects of peanut processing on masticatory performance during variable appetitive states." *J Nutr Metab* (in press).

These publications further document the weak effect peanuts have on body weight and highlight their other health benefits related to cardiovascular disease and diabetes risk. Part of the mechanism accounting for the limited impact of peanuts on body weight relates to the efficiency of absorption of the energy from peanuts. The degree to which they are chewed determines the amount of bioaccessible energy they provide.

Current work underway in Brazil is exploring the effects of peanut consumption with the morning meal on glycemia (blood sugar response) after that meal and the following meal. Whole peanuts, peanut butter, peanut oil, and peanut flour are being tested. In addition, effects on gut hormones related to satiety and appetite sensations are being monitored. The goal is to determine whether inclusion of peanuts in the first meal of the day may help to control blood sugar over the day.

SORGHUM, MILLET AND OTHER GRAIN CRSP (INTSORMIL)

Bruce Hamaker, professor in the Department of Food Science, had activities in two USAID-funded INTSORMIL CRSP projects in the West Africa region. In work with the Institut de Technologie Alimentaire (Food Technology Institute) in Dakar, Senegal, Hamaker conducted collaborative research on a sorghum cultivar with some wheat-like properties for high incorporation of sorghum flour into wheat-based bread. This work could make it possible for people to utilize locally grown sorghum in baked products and, thus, provide the opportunity for a new market for sorghum for local farmers and reduced wheat imports. In another INTSORMIL project, funded through the USAID Mali Mission, Hamaker works with a cereal technologist from Dakar and a scientist from the agricultural research institute, IER, in Mali to promote millet and sorghum processing in the northern Mopti/Gao region. They work with six women's groups of cereal processors

toward two goals: 1) finding basic mechanized processes that can convert these grains to high-quality, competitive products and 2) expanding markets for locally grown grain. In the spring of 2009, they installed dehullers and mills, on a payback scheme, in the units and in June conducted a five-day training workshop on cereal processing. The research and dissemination unit at IER in the Bamako area is also being equipped for technology development and training of urban entrepreneurs in improved cereal-processing methods.

John Sanders continues with the technology diffusion project that arose from the INTSORMIL PRF Project 103, “Development of Input and Product Markets in West Africa for Sorghum and Millet,” which has focused on introducing to farmers’ associations new technologies for millet and sorghum combined with new marketing strategies to pay for the higher input costs. Presently, this work is in three Sahelian countries, Senegal, Niger, and Mali. The technologies are defined in collaboration with the national agricultural research institutions and include improved cultivars, moderate levels of inorganic fertilizer, seed treatment, a water harvesting technique, and improved agronomic practices. The project also introduced a series of five marketing strategies designed to moderate or avoid the price collapses associated with staples, increase value-added, and increase the bargaining power of the farmers’ associations. With combinations of these techniques prices increased 30 to 50 percent which helped facilitate the introduction of the moderate levels of inorganic fertilizer.

For the past two years INTSORMIL has been working on a grant from USAID-Mali to extend new technologies to farmers and to strengthen the research (IER) and extension services (DRA) of Mali. This has involved a food science initiative to complement project activity by providing machinery and services to millet food processors in Mopti and further north in Mali, a decru sorghum, applied agronomy research program, and training for IER researchers at Purdue and Kansas State. Much of the efforts this past year were focused on supporting this Mali program. In 2009 there are over 1,000 ha in new technologies and ten farmers’ associations in the project in Mali. Present efforts are focused on improving the seed supply capacity within the program and with the national agricultural research institute and on building ties with other agencies to engage in scaling up of the project to a larger number of farmers.

Since 2001, Mitch Tuinstra (AGRY) has been the interdisciplinary research project coordinator for improved sorghum variety development/adaptation in West Africa. The program focuses on developing and transferring technologies to improve sorghum crop production, performance, and value in the region. Sorghum researchers and producers have indicated that weed infestations, including parasitic witch weed, are among the most important production constraints

for sorghum. *Striga* is recognized as a growing problem and it is estimated that more agricultural land in West Africa (3.5 million ha) is infested with *Striga* than in any other region. No single technology has been shown to be effective in controlling *Striga* or containing its spread; however, the integration of control options has been shown to be effective in reducing damage by the parasite.

One new and promising *Striga* management technology being developed in our program involves use of herbicide tolerance traits for managing this weed. A project was initiated to develop sorghum varieties with tolerance to acetolactate synthase (ALS) inhibiting herbicides. A sorghum mutant with high levels of tolerance to ALS-inhibiting herbicides was identified. Genetic crossing and backcrossing was used to transfer this trait into elite grain sorghum varieties. Current studies are focused on determining the efficacy of low-dose herbicide seed coatings to control *Striga* infestation in sorghum. In 2008–9, these treatments were tested in multi-location trials in Niger, Burkina Faso, and Mali. Tuinstra and DuPont collaborators traveled to Africa to meet with collaborators and visit the field trials. The first stop was Kenya, where they met with USAID officials in Nairobi and visited Kisumu in western Kenya to observe performance of an herbicide-resistant maize seed developed by CIMMYT, the International Maize and Wheat Improvement Center. Next Tuinstra flew into Bamako, Mali, and met officials from IER and ICRISAT, and visited field trials demonstrating herbicide seed treatments. Heavy rains had compromised the studies. Burkina Faso was next with INERA meetings in Ouagadougou and field trial visits for *Striga*-resistant and herbicide-treated sorghum seeds in Bobo-Dioulasso. In contrast to the test plots in Mali, these experiment plots looked excellent. Then in Niamey, Niger, they met with INRAN researchers and visited sorghum test plots, which provided outstanding results. A row of puny sorghum awash in *Striga* flowers next to a robust row absent of the blooms documented the experiment’s success.

Purdue/IPIA was awarded a \$1,000,000 subcontract for the *Training* component from the *Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali* project. IER identified eight researchers for training in the United States; five for academic (degree) programs and three short-term programs. Four of the academic students (Aly Ahamadou, Fatimata Cisse, Mamadou Dembele and Bandiougou Diawara) arrived in the United States in late June 2009 to begin their six-month English language training at the Indiana Center for Intercultural Communication (ICIC) at Indiana University Purdue University-Indianapolis (IUPUI). Their Intensive English Language program includes a “family homestay” component to help with English skills and cultural understanding. In the fall they will also take one academic class at IUPUI to help them acclimate to the U.S. classroom and practice their English skills in another setting.

News from Departments



Agricultural Economics (AGEC)

Philip Abbott received a grant from Development Economics Research Group (DERG), Department of Economics - University of Copenhagen, which funded research on Investment, Trade, and Development Linkages in Vietnam. This resulted in a presentation July 2008, and another in July 2009, to the Central Institute for Economic Management (CIEM) in Hanoi. The research was also presented to the International Agricultural Trade Research Consortium (IATRC) at a meeting in Seoul.

Abbott also did research on high international commodity prices impacts on developing countries, funded by the Organization for Economic Co-operation and Development (OECD) and by the African Economic Research Consortium (AERC). Research presentations have been made three times to the OECD in Paris, once to the AERC in Mombasa, Kenya, as well as to the IATRC in Seattle and the International Food Policy Research Institute (IFPRI) in Washington, D.C.

Joan Fulton is co-mentoring graduate student, Miriam Otoo, who was awarded a Norman E. Borlaug International Agricultural Science and Technology Fellowship from the Leadership Enhancement in Agriculture Program funded by the USDA, to travel for data collection for her PhD dissertation. The main objective of her research is to examine key constraints in the development of cowpea flour processing businesses in West Africa. Otoo will be conducting her fieldwork in Benin, Ghana, Niger, and Nigeria under the supervision of her mentors. Otoo was also awarded the African Women in Agricultural Research and Development (AWARD) Post-Master's fellowship.

Thomas Hertel and Terrie Walmsley are the Executive Director and Director respectively of the Center for Global Trade Analysis (GTAP), the university-based home for GTAP, a global network of researchers and policy makers conducting quantitative analysis of international policy issues. The aim of the project is to improve the quality of global economy-wide analysis through education and develop analytical databases, economic models, and

innovative methodologies. These efforts are supported by funds from 26 international and national organizations, including the World Bank, USDA, the European Commission, and the OECD. In the past year, the Center staff has used the GTAP framework to analyze a number of important global economic policy issues, including international migration, the impacts of biofuel expansion, and the poverty consequences of climate volatility. GTAP analysis also played a key role in the California Air Resources Board's Low Carbon Fuel Standard. On the database front, in 2008 the Center released version 7 of the GTAP Data Base, covering 113 countries/regions and 57 commodities. The GTAP Data Base is a global economic database used by academics and institutions from over 160 countries. The GTAP Data Base and models underlie most contemporary analysis of trade issues and are increasingly used to examine the economic impact of global environmental issues, such as bio-fuels and climate change. This year's annual conference was hosted by the United Nations Economic Commission for Latin America and the Caribbean in Santiago, Chile. There were nearly 200 participants from around the world, and 175 papers were presented at this event. Next year (2010), the conference will be hosted by the United Nations Economic and Social Commission for Asia and the Pacific in Bangkok, Thailand.

William A. Masters and Gerald E. Shively continued as co-editors of *Agricultural Economics*, the journal of the International Association of Agricultural Economists. The highlight of this year was the unprecedented rush to publish a special issue on the world food crisis, which appeared in December 2008. In midsummer, food prices kept rising and with them came a flood of unpublished research and press reports about the emerging crisis. As scholars, they expressed irritation that the most widely discussed studies were not always the most authoritative—sometimes they were simply the most controversial, or the most heavily promoted. As journal editors, they saw an opportunity to do something about that, by using peer review and professional publishing to improve circulation of the best possible work. Their worldwide Call for Papers and received over 60 manuscripts, which were sent to more than 100 referees and resulted in 15 excellent articles that used descriptive, econometric, and simulation methods for

both global overviews and regional case studies. The issue is available online here: <http://www3.interscience.wiley.com/journal/121554063/issue>

William Masters also completed a new book for the World Bank entitled *Distortions to Agricultural Incentives in Africa*, co-edited with Kym Anderson. The book was published in early 2009 and is also available online at www.worldbank.org/agdistortions.

Gerald Shively is co-mentoring master's student, *Christopher Chibwana*, who was awarded a Norman E. Borlaug International Agricultural Science and Technology Fellowship from the Leadership Enhancement in Agriculture Program. The main objectives of his research are to relate Malawi's Starter Pack Scheme, the input subsidy program, and government's use of price controls in Malawi. He will be conducting his fieldwork in Malawi under the supervision of his CGIAR mentor. His research is also supported by Michael Carter, the Director of the Assets and Market Access (AMA) CRSP.

Wallace Tyner presented a paper at the Ericé Conference on Planetary Emergencies in Ericé, Italy, in July 2008.

Holly Wang and *Freddie Barnard* led a study-abroad course titled Globalization and the U.S.-China Economic Interactions. Wang and Barnard took students on a 17-day trip to China, traveling to Beijing, Xi'an, Chongqing, and Shanghai. They visited universities, farm households,

factories, financial firms, U.S. fast food restaurants, local markets, international supermarkets, and 2008 Olympic and historical sites. Students experienced a diverse economy with both primitive and modern production, and oriental tradition and westernizing trends.

Holly Wang has also been working with graduate student David Ortega on a project about pork consumption and production in China. Supported by the Mission Grant from our college, they spent a month in China in the summer of 2008 collecting consumption data in Beijing and Shanghai. This summer they returned again, supported by National Science Foundation, to do more surveys on pork consumption with regard to food safety. The survey has been conducted in six cities with the help of their Chinese collaborators at the China Agricultural University, Shanghai Jiaotong University, Inner Mongolia Agricultural University, and Southwestern University of Finance and Economics. Several papers and posters have been published and presented in journals, magazines, and at national and international conferences.

Wang coached a team of three Purdue Ag Econ graduate students that placed fourth in the International Agribusiness Management Association's (IAMA) Case Study Competition in Budapest, Hungary. The team consisted of David Moll, Amber Rankin, and Joshua Yoder.

The Center for Food and Agricultural Business continues in program development and implementation of the project titled Strategic AgriMarketing: A Program for Food and Agribusiness Managers of Portugal. The Center is pursuing publication in peer-reviewed, academic journals of the four Portuguese agribusiness case studies, based on field research conducted in-country last year. The case studies are being jointly developed by faculty/staff in the Center in collaboration with faculty and staff in Portuguese institutions. Concurrently with the development and publication of the case studies, an autumn trip is planned to deliver a management development program to agribusiness managers in the food and agribusiness sectors of Portugal. This Strategic AgriMarketing program would incorporate the case studies, and would provide Portuguese managers with new ways of analyzing marketing problems. It would place a significant focus on strategy and decision-making tools that are critical to marketing success. The Center for Food and Agricultural Business offers a MS-MBA in Food and Agribusiness Management. This 27-month, dual-degree program for working professionals in the food and agribusiness industries is delivered almost entirely using distance education and awards a Master of



Purdue students in China study globalization and the economic interactions between the United States and China.

Agricultural Economics continued

Science degree from Purdue and an MBA from Indiana University's Kelley School of Business. Students in the program are required to attend five one-week residency sessions—four in the United States and one abroad. This year the students in the MS-MBA program completed their international residency in the cities of Buenos Aires and Rosario, Argentina, from Saturday, May 23 to Saturday, May 30. The residency consisted of three components. First, the students worked with faculty from Universidad Austral on sessions related to Argentine policy and issues facing South American food and agribusiness managers. Second, the students had regular lectures from the U.S. faculty teaching the core course in strategy. Finally, the students participated in field visits to Argentine food and agricultural companies. These on-site visits involved travel to surrounding areas to gain first-hand perspective on the South American food and agribusiness market.

Agricultural and Biological Engineering (ABE)

Al Heber traveled to Hangzhou to visit Zhejiang University as a guest of Professor Kaiying Wang. Al gave a seminar on his research and visited modern swine and dairy farms.

Klein Ileleji spent three weeks (May 24 to June 16) at the State Key Lab for Clean Energy Utilization (CEU), Zhejiang University in Hangzhou, P.R. China. While in China, he worked with colleagues there on the logistics of biomass to power plants for electric generation. Like the United States, China has a growing interest in utilizing biomass for biofuels and biopower production. One of the areas of focus is the production of electricity and steam in 100 percent biomass-fueled plants. On this trip, Ileleji worked closely with Prof. Qinhui Wang and his graduate student, Hongde Yu, on the supply logistics of transporting and feeding three biomass types to a 100 MW located in Zhanjiang City, Guangdong Province (south of China, close to Hong Kong). Part of this work will be presented in a poster session at the Bioenergy Engineering conference in Bellevue, Washington, October 11–14, 2009. During Ileleji's visit, Jay Gore, Director of Purdue's Energy Center, also visited the CEU to promote collaboration in energy related research between faculty from Purdue and Zhejiang. Both visits were part of a sponsored program (Program 111) to host foreign faculty from various disciplines in the area of energy at CEU. Program 111 is a five-year program aimed at supporting collaborative research exchange through short-term visits at Zhejiang University by faculty and their graduate students from U.S. and European universities.

Monika Ivantysynova and graduates Christopher Williamson, Joshua Zimmerman embarked on a trip around the world on the 9th of September and presented papers at conferences in Bath, England, and Toyama, Japan. Williamson presented a paper at the Bath/ASME Symposium on Fluid Power and Motion Control titled "Efficiency study of an excavator hydraulic system based on displacement controlled actuators." Following the Bath conference they preceded to Toyama where the 7th JFPS International Symposium on Fluid Power was held. There Williamson presented a poster on his paper, "Pump Mode Prediction for Four-Quadrant Velocity Control of Valveless Hydraulic Actuators," and Ivantysynova presented a keynote lecture on her paper entitled, "Innovations in Pump Design—What Are Future Directions?"

John Lumkes traveled with four ABE students (Austin Bello, Craig Blough, John Gibson, and Jacob Oswalt) from May 17–26 to Bangang, Cameroon, to assist the African Centre for Renewable Energy and Sustainable Technology (ACREST, www.acrest.org) with developing affordable transportation for rural areas in Africa. During the spring semester, the students were members of a student design team advised by Lumkes. The team focused on designing and building a basic utility vehicle (BUV) for developing countries (www.drivebuvs.org), with an emphasis on vehicle use in Cameroon. In addition to the transportation project, the Purdue group also helped with renewable energy projects, including wind and water electricity generation and pressing oil from local seeds (jatropha, castor, and avocado) for use as a renewable biofuel source for the vehicles. During their time in Cameroon, the Purdue group repaired and improved a demonstration BUV for ACREST, sketched designs for a cross-flow hydroelectric turbine, discussed the formation and layout of a local micro-factory to produce BUVs using local parts, participated in the national day festival and a funeral celebration, ate a wide variety of local foods, met with faculty and staff at the University of Dschang, hiked to several waterfalls, and made lasting friendships with the members of ACREST. The trip was a joint effort with College of Agriculture, the College of Engineering, ACREST, the Institute for Affordable Transportation, and the Agricultural and Biological Engineering Department. The goal is to continue developing a sustainable partnership with ACREST in the areas of affordable transportation, renewable fuels, sustainable agriculture and food preservation, wind and hydro energy generation using appropriate technology for local villages, and soil and water environmental projects.

Jenna Rickus was selected as a U.S. delegate to the National Science Foundation (NSF) funded Women's International Research Engineering Summit (WIRES) for the field of micro/nanotechnology. The summit connected women researchers from around the world in the fields of energy systems, micro/nanotechnology and simulation-based engineering. The summit was held June 1–4 in Barcelona, Spain.

Mark Thomas, ABE PhD student, presented a poster at a joint China and U.S. meeting “Consequences for Global Environmental Changes,” held in October in Beijing, China. The workshop was geared towards developing a large-scale framework for joint research/education programs between China and the United States in the area of sustainable bioenergy production, feedstock management, and technology transfer.

Agronomy (AGRY)

Richard Grant has been working with the Geography Department of Nouakchott University in Mauritania to develop research collaborations. A trip in March 2009 to Nouakchott, Mauritania, originally planned as a research techniques workshop, was used to further discussions on ways in which he could support a new master's program beginning in the department and further research in aerosol transport during sandstorms. During the trip, he also explored venues for a short course titled Global Climate Change in the Sahara Desert for Purdue undergraduates during spring break.

Scott Jackson continued on the advisory board for the Generation Challenge Program, part of the CGIAR and Gates foundation, and served on the organizing committees of the International Genetics and Genomics of Legumes Conference (Puerto Vallarta, Mexico 2008) and the World Soybean Congress (Beijing, China 2009). He also spoke at the following international meetings: the Darwin Conference, Rennes, France, 2009; the International Genetics and Genomics of Legumes Conference, Mexico 2008; the Grain Legumes Conference, Kanpur, India, 2009; the ICRISAT, Hyderabad, India 2009; the Max Plank seminar series, Cologne, Germany, 2008; the Universit e de Paris Sud, Paris, France, 2009; the Plant Genomes Europe Meeting, Bulgaria, 2008; the South American Soybean Conference, Goiania, Brazil, 2009; EMBRAPA-Soja, Londrina, Brazil, 2009; and the Plant Genomes China, Chongqing, China, 2009.

Jackson is working with Indian collaborators and the Indian government to sequence cowpea and pigeonpea genomes. He also participated in an international research data release workshop in Toronto, Canada (NIH, NSF, Wellcome Trust, Gates Foundation, Genome Canada).

Cliff Johnston developed collaborations with the Environmental Geochemistry group at CSIC – Estacion Experimental del Zaidin (Dr. Javier Huertas) in Granada Spain and with the Department of Geology at the University of Bari (Italy) entitled “Characterization of the mineral/solution interface in clays by infrared spectroscopy and atomic force microscopy: Effect of electrolytes and organic acids.” This project is funded by a joint research agreement between Spain and Italy and provided funds for PhD student Elena Ramos to work at Purdue for three months (Sept.–Nov.) in 2008 and for her to return for another three-month visit the fall of 2009.

In 2008, *Johnston* was invited to a workshop in Calgary, Canada, focused on issues related to clay minerals and the oil sands. As a follow up to this workshop, he wrote a proposal, which has been funded by a consortium of oil companies call CONRAD. The project is expected to start the fall of 2009. He also was invited to present one of five plenary session talks at the 14th International Clay Conference held in southern Italy (June 2009).

Jianxin Ma attended the IV International Conference on Legume Genomics and Genetics, December 7–12, 2008, Puerto Vallarta, Mexico. He also helped organize the Transposable Elements (TE) Workshop at the International Plant & Animal Genome (PAG) Conference, held January 12–16, 2009, in San Diego, California.

Robert L. Nielsen recently returned from New Zealand where he participated as an invited speaker at the triennial Foundation for Arable Research Maize Conference held in Hamilton, NZ. He was one of three international speakers on the program and gave five presentations on various aspects of maize production and precision agriculture to the audience of 200 maize growers, independent crop contractors, and agricultural industry representatives. Following the conference, he also participated in a series of grower field days scattered around the north island of NZ reaching out to approximately 150 additional growers and industry reps that were not able to attend the conference the previous week.

Agronomy continued

Dev Niyogi was an invited participant at a Workshop on Cyberinfrastructure sponsored by the National Science Foundation Office of Cyberinfrastructure and held at Tsinghua University in Beijing, China. During the course of his visit, he also gave presentations to a hazard mitigation group at the Chinese Academy of Sciences on the role of agricultural intensification, urbanization, and land-use change impacts on weather and climate. He also described the role of satellite and land data assimilation systems for studying these processes.

Niyogi received a National Science Foundation based CAREER award to study the role of land use and land cover changes on the Indian monsoons. He visited India for two weeks in May 2009 and had a series of meetings with a number of researchers and policy makers in the Indian Institute of Technology Delhi, India Meteorological Department, Department of Science and Technology and Department of Earth Sciences, and the Indian Space Research Organization's National Atmospheric Research Lab. Dr. Chandra Kishtawal from the Indian Space Research Organization is visiting Purdue for six months as part of a joint project with Niyogi to utilize satellite datasets for climate change studies.

Niyogi and students from his group, Hsini Chang and Souleymane Fall, were part of an international study and resulting papers that document and make recommendations for the impact of land use and land cover change on weather and climate studies.

Herb Ohm, George Van Scoyoc, Brad Joern, and Jeff Volenec assisted in a USAID-sponsored program to rebuild higher education in Afghanistan, which was in its second year. Twelve Afghan students comprise the Afghan Merit Scholars (AMS) program in the College of Agriculture. Four AMS students are currently being mentored by agronomy faculty. Topics of study include wheat breeding and genetics, and soil fertility/plant nutrition. In addition, these faculty and others in the Department of Agronomy participated in educational programming aimed at increasing agricultural literacy of National Guard units being deployed to Afghanistan. The goal of this effort is to provide the military with key knowledge that will enable them to improve agricultural productivity at the local level in Afghan communities. A model Afghan farm has been constructed at the Muscatatuck Urban Training Center in Southern Indiana. A second model Afghan farm is scheduled to be created in 2010 at the Agronomy Center for Research and Education near West Lafayette, Ind.

Torbert Rocheford taught a weeklong course on molecular-marker-assisted breeding at the African Centre for Crop Improvement (ACCI) at the University of Kwazulu-Natal in Pietmaritzburg, South Africa. ACCI is supported by Gates/Rockefeller. He gave an invited talk on molecular genetic strategies to facilitate enhancement of beta-carotene in maize at the Maize HarvestPlus meeting in Kumasi, Ghana. This program is supported by Gates, USAID, and various international donors, and targets biofortification efforts to sub-Saharan Africa and various parts of the developing world. He also presented an invited talk at the John Innes Centre, Norwich, U.K.

Rocheford organized a multi-institutional maize winter nursery experience in Puerto Vallarta, Mexico. This involved faculty and students from Purdue, Illinois, Iowa State, U.C. Berkeley, U.C. San Diego, Marquette, and Cold Spring Harbor Laboratory. The corn was grown at P.V. Winter Services, which is owned and operated by Cruz Robdello, a Purdue alumnus. Mexican students from Irapuato attended. This effort will evolve into a winter nursery hands on field short course, involving undergraduate and graduate students from the United States and Mexico.

Steven Scofield was invited to speak at the 2009 Science Forum, sponsored by the CGIAR and FAO, held in Wageningen, Netherlands. His presentation described how virus-induced gene silencing could be used to functionally identify genes that can then be used to improve wheat and other crops. He has also been asked to serve as a consultant for the Crop Science group of Bayer AG, Leverkusen, Germany.

Lori Unruh Snyder and 14 students from various colleges and departments at Purdue went to Honduras and Guatemala during spring break of March 2009 for an international study-abroad class. The theme of the course was sustainable farming systems. During Maymester 2009, she taught her first class in Costa Rica at EARTH University in conjunction with the University of Florida, hosting 18 students from a total of four different universities. Students learned about sustainable agriculture in the tropics, as well as entrepreneurship and social issues. The class and research was sponsored by the USDA-Higher Education Challenge Grant. She also continues to host international students from both Zamorano (Honduras) and EARTH (Costa Rica) Universities for student short-term exchanges for research learning.

Snyder and graduate student, Anna Verseman, are currently collaborating with Dos Pinos, a dairy milk cooperative, and Enlasa, a Central American fertilizer company, to establish best management practices for pasture utilization for dairy farmers in the San Carlos region in Costa Rica.

Snyder received the first Young Faculty Internationalization Award from Purdue University-International Programs in April 2009.

James Vorst worked with the International Certified Crop Adviser Program to develop the competency areas and performance objectives for an Indian Certified Crop Adviser (CCA) program. He attended the Cereal System Initiative for South Asia in New Delhi during which the Indian CCA program was launched. He met with a committee of public and private agronomists to identify performances required of Indian crop advisers, and then constructed the competency and performance objective document for their program. Vorst has begun writing the first Indian CCA minimum competency exam, to be administered in 2010, based on the competencies and performances identified by the committee.

Animal Sciences (ANSC)

Layi Adeola participated in research planning meetings, and attended and gave papers at the World's Poultry Congress held in Brisbane, Australia, June 30–July 4, 2008. In February 2009, he gave a keynote lecture at the Nigerian International Poultry Summit and Symposium of the Nigerian branch of the World's Poultry Science Association in Abeokuta, Ogun State, Nigeria, and led research discussion groups. Adeola also presented highlights on phosphorus digestibility research at Purdue to a focus group and gave papers at the Digestive Physiology in Pigs Symposium in Montbrió del Camp, Tarragona, Spain, May 20–22, 2009.

Todd Applegate was a visiting Scientist in Technopark, Tulln, Austria, from June 2008–May 2009 where he studied antibiotic replacement strategies for poultry. Additionally, he conducted Poultry 101 and Intestinal Dynamics workshops for various livestock and feed additive companies while in Austria. While on sabbatical in Austria, he gave two department seminars for the Department of Animal Nutrition at the Agricultural University of Athens, Greece, (Barrier functions of the intestine—maintenance and cost; Reducing the impact of the poultry industry on the environment), and a departmental seminar for the Faculty of Veterinary Medicine at the University of

Thessaly in Kardista, Greece. He also gave several invited talks: one for Gruppo Veronesi in Verona, Italy, on the barrier functions of the broiler intestine, maintenance, cost, and influence of feed additives; a second on the use of co-products of the ethanol industry at the XXIV Curso De Especialización Feducion Espanola para el Desarrollo de la Nutricion Animal in Madrid, Spain; and last, a seminar on the advances in digestive physiology and nutrition in poultry at the Universidad Politecnica de Madrid, Department of Animal Production.

Heng-wei Cheng hosted 16 Chinese students from the School of Animal Science and Technology, Zhejiang University, for the 2009 Summer Research Program for Chinese Students.

Paul Collodi was an invited speaker at the World Fisheries Congress held in Yokohama, Japan October 20–24, 2008 and also presented a seminar at Tokyo University of Marine Science and Technology. He also served as an invited participant at the Wellcome Trust Zebrafish Gene Targeting Strategy Meeting held at the Sanger Institute in Cambridge, UK.

Dale Forsyth teaches an animal nutrition course online that reaches and is having an impact on an international audience. It has had students from 10 countries besides the United States. The countries are England, Puerto Rico, Singapore, Kyrgyzstan, Scotland, Hong Kong, Cyprus, India and Germany. There have been recent inquires about the course from Lesotho (S. Africa), Australia, and Sri Lanka. The course, ANSC 221Y (now ANSC 22100), is a self-paced, asynchronous course with online materials and conventional, proctored exams. Registration takes place continually, and students that don't finish in the term they register for are given one year to complete the course.

Alan Grant met with colleagues at INRA (the French National Institute for Agricultural Research) in St. Gilles, France, and at the Agrocampus Ouest in Rennes, France, to present and discuss muscle growth and meat quality research results. He was accompanied by research scientists from Pig Improvement Company, USA.

Mickey A. Latour was invited to University College Dublin, Ireland, to discuss the implementation of a distance-learning course to reach citizens throughout the country. During that trip, he also presented a talk on the factors, which cause smeary fat in swine as it relates to bratwurst and bacon products.

Animal Sciences continued

Amy Lossie spent two weeks in March 2009 as a visiting faculty member at the request of Tanta University, Tanta, Egypt. While there, she gave lectures to faculty, graduate students, and undergraduates in the Faculty of Agriculture. She was also a keynote speaker at two conferences in Egypt: the 2nd Annual Biotechnology Conference at Tanta University and a Biotechnology Symposium at Suez Canal University. She spent many hours discussing research programs with individual graduate students and faculty members. These productive discussions led to Amy serving as an advisory committee member on a graduate student's thesis project. She also is investigating the possibility of having this student train in her laboratory for six months this coming year. Amy met with the Administration at Tanta University and was involved in potentially establishing formal collaborations between Tanta University and Purdue.

Biochemistry (BCHM)

Clint Chapple presented a talk entitled, "What can *Selaginella* tell us about the evolution of phenylpropanoid metabolism" at the Banff Conference on Plant Metabolism in Banff, Alberta, Canada (July–August 2008). Nick Bonawitz, Xu Li, and Shinyoung Lee, post-doctoral researchers in Chapple's lab, also presented posters at the conference. Chapple also was invited to speak at the University of British Columbia where he presented a seminar entitled, "Lignification of plant cell walls: a milestone in plant evolution" (May 2009).

James Forney traveled to Potsberg, Germany, to present a poster entitled, "Comparative genomics within a single species: using ohnologs to search for transcriptional promoter in *Paramecium tetraurelia*," at the Fourth International GDRE Paramecium Genomics meeting (October 2008).

Joseph Kappock gave a talk entitled "A specialized citric acid cycle requiring succinyl-coenzyme A (CoA): acetate CoA-transferase (AarC) confers acetic acid resistance on the acidophile *Acetobacter aceti*," at the 2nd International Conference on Acetic Acid Bacteria in Nagoya, Japan (2008).

David Krogmann traveled to the Institution Potosino de Investigación Científica y Tecnológica in St. Louis Potosi, Mexico, in February 2009 to give a lecture on "How to Write and Publish a Scientific Paper" to graduate students finishing PhD work in Molecular Biology.

Xiaoqi Liu traveled to Porto, Portugal, as an invited speaker and gave a talk entitled "Plk1 chromosome dynamics" (September 2008).

Andy Tao presented a talk entitled, "In toto isolation of phosphopeptides on soluble nanopolymers" at the 2nd World Chinese Forum on Mass Spectrometry (June–July 2008). He also presented a talk entitled, "Proteomics approaches to phosphorylation-dependent protein-protein interactions" at Yang-Ming University.

Henry Weiner organized a meeting on the Enzymology and Molecular Biology of Carbonyl Metabolism. This was the 14th time he organized the meeting. The July 2008 meeting took place in Kranjska Gora, Slovenia, which is located in the Julian Alps a few kilometers from both Italy and Austria. At the meeting he presented a talk entitled, "How Do You Really Determine the Role of an Amino Acid in an Enzyme? Experiences from Aldehyde Dehydrogenase." He also presented a poster entitled, "A Point Mutation Produced a Class 3 Aldehyde Dehydrogenase with Increased Protective Ability Against the Killing Effect of a Cyclophosphamide Drug."

Botany and Plant Pathology (BTNY)

Jody Banks gave a talk entitled "The *Selaginella* genome" to the Microbiology Department at the Catholic University, Santiago, Chile, in January 2008.

Nick Carpita continues his international collaborations and presentations, which follow: 1) "Structure and Biosynthesis of the Cell Walls of Grasses," Plenary Lecturer, Plant polysaccharide Workshop, Sigtuna, Sweden, August 2008; 2) "Maize: A genetic model for improvement of energy grasses," Plenary Lecturer (by video feed), Biomass and Bioenergy Conference, São Paulo, Brazil, September 2008; 3) "Structure and Architecture of the Plant Cell Wall," Plenary Lecturer, 50th Latin American Conference of Plant Physiology, Rosario, Argentina, September 2008; and 4) "Maize: A genetic model for improvement of energy grasses," Seminar, Department of Chemistry, University of Buenos Aires, Argentina, September 2008.

Zhixiang Chen presented his work at Zhejiang University, Hangzhou, China, in December of 2008. The topic of his presentation was "WRKY transcription factors in plant defense responses."

Peter Goldsbrough traveled to Asia in January 2008 to present his research to several universities. His presentation titled “Metallothioneins: metal binding proteins that modulate metal accumulation in plants” was presented at the National Institute of Biological Sciences, Beijing, China; Ochanomizu University, Tokyo, Japan; Chiang Mai University, Thailand; and Mahidol University, Thailand. In June 2008, Goldsbrough also attended and presented at the Fifth International Weed Science Congress in Vancouver, Canada. His talk was on “Using *Arabidopsis* to understand how herbicide safeners induce the expression of xenobiotic detoxification systems.”

Steve Goodwin helped organize the 7th International Mycosphaerella and Stagonospora Symposium in Ascona, Switzerland held August 2008. He was invited to give the keynote talk, “Genetics and genomics of the *Septoria* pathogens of cereals,” and presented two posters: “Population genetic structure of *Phaeosphaeria nodorum* in the central United States” (#A102); and “Validation of a new map location for the *Stb3* gene for resistance to septoria tritici blotch in wheat” (#A106). He was also invited to present his research titled “Genome expansion and transposable elements in *Mycosphaerella*” to the Mycosphaerella group at Plant Research International, Wageningen, The Netherlands, on October 20, 2008.

Goodwin hosted two visiting scientists from the All-Russia Research Institute of Phytopathology, Golitsino, Russia, for two weeks in July 2008. He then attended the 50th anniversary celebration of the All-Russia Research Institute of Phytopathology, Golitsino, Russia on November 26–27, 2008. He also served as a member of the Scientific Advisory Group and attended the annual meetings of the European project BioExploit, October 2008.

Bill Johnson was an invited symposium speaker at the International Weed Science Congress held June 23, 2008, in Vancouver, British Columbia. His symposium presentation was titled “Winter Annual Weeds as Alternative Hosts for Soybean Cyst Nematode.”

Ray Martyn was the keynote speaker at the XIV Congress of The Spanish Society of Phytopathology, in Lugo, Spain (Sep 2008). His talk was titled “The future of the profession of plant pathology: A U.S. perspective.”

Tesfaye Mengiste presented at two international meetings this past year. In July 2008, his talk titled “Dissecting Molecular and Cellular Processes Regulating Responses to Necrotrophic Pathogens” was part of the 19th International

Conference on Arabidopsis Research in Montreal, Canada. In August 2008, he presented “Induced defense against *B. cinerea*” at the 9th International Congress of Plant Pathology (ICPP 2008) in Torino, Italy.

Entomology (ENTM)

Grzegorz Buczkowski was an invited speaker at the XXIII International Congress of Entomology (ICE) held in Durban, South Africa, in July 2008. His talk “The diminutive supercolony: Argentine ants of the southeastern United States” was part of a symposium entitled “The biology of a global invader: the Argentine ant.” The symposium brought together key researchers from around the world working on the biology and control of the invasive Argentine ant.

Buczkowski was also an invited participant at the July 2008 workshop organized by Stellenbosch Institute for Advanced Study, Stellenbosch University in South Africa. The goal of the workshop was to bring together Argentine ant researchers from around the world to discuss the latest science being conducted on this widespread invasive species. The workshop included talks on Argentine ant ecology, evolution, behavior, and distribution. In addition to fruitful discussion, the participants are collaborating on publishing a multi-authored review on Argentine ant biology in a major ecological journal.

Rick Foster was an invited speaker for the World Tomato Congress held in Leon, Mexico, in July 2008. Foster was also very active with several Afghanistan activities. First, he served as a mentor for one of the Afghan faculty on campus August–December 2008 funded by the FAS/USDA Faculty Exchange Program. Second, he was part of an assessment team that visited Kabul in September 2008 to do a curriculum assessment of the Faculty of Agriculture at Kabul University. And finally, he has been an instructor for three agriculture workshops held from November 2008 to February 2009 for National Guard troops preparing to deploy to Afghanistan.

Jeff Holland, in collaboration with Cliff Sadof (ENTM) and Tamara Benjamin (CATIE), successfully solicited funding from the World Trade Organization to meet in Costa Rica in August 2009 to further work towards an International Phytosanitary Certification System.

Entomology continued

Greg Hunt hosted Serbia Borlaug Fellow, Nebojsa Nedic, for five weeks during the Fall 2008 semester. The Fellow's interest and research focus was on various aspects of honey bee genetic research and breeding to increase disease resistance characteristics.

Hunt made a follow-up investigative visit to Villa Guerrero, Mexico, in February 2009 regarding behavioral research with graduate students from North Carolina State University and our Mexican collaborator. Behavioral assays were used on individual bees from European x African hybrids to identify genes that are involved in individual stinging behavior and individual responsiveness to queen pheromone. This visit involved working with collaborator, Miguel Arechavaleta-Velasco, with the Mexican agricultural research service (INIFAP). He is the national coordinator for bee research at INIFAP, and he obtained his PhD at Purdue University.

Linda Mason gave a presentation at the XXIII International Congress of Entomology (ICE) held in Durban, South Africa, in July 2008. Mason spoke in the urban, stored product, and post harvest entomology section on "A real world examination of sulfur dioxide as a replacement for methyl bromide in Midwestern U.S. flour mills." Co-authors on the paper were T. Tsai, and K. Ilesje. She also served as a co-organizer and co-moderator for the symposium entitled Ecology and Management of Stored-Product Insects in Large-Scale Facilities.

Cliff Sadof continues to advise two PhD students at CATIE in Costa Rica, Eduardo Hidalgo and Mildred Linkimer. At the request of Eduardo Hidalgo, in May 2009 he taught ENTM 691, an independent study class, at CATIE in Costa Rica. The topic was "Persistence and repellency of insecticides." In collaboration with Tamara Benjamin of CATIE, he developed a proposal for the World Trade Organization on furthering the Clean Stock Program in Costa Rica to other crops.

Steve Yaninek served as a co-organizer for the "Connecting Insect Science with the Public" session in the Science Education Outreach Symposium at the XXIII International Congress of Entomology in Durban, South Africa, in July 2008. He was also an invited speaker at the International Workshop and Training Course on Invasive Species in Wuhan, China, in October 2008. He gave two talks: "Biological control of the cassava green mite in Africa: overcoming challenges to implementation" and "Biological control of invasive species: challenges to mitigating global concerns and seizing local opportunities."

Yaninek was an invited speaker at the 3rd International Symposium of Entomological Science COE held at Kyoto University in Kyoto, Japan, November 2008. The symposium topic was "Construction of the Novel Pest Management Model Based on Biological Interactions." Yaninek's presentation title was "Host Plant Recruits Introduced Bodyguards in Defense of Exotic Cassava Green Mites in Africa." As a member of the North Central Advisory Committee NCAC-15, Departments of Entomology, he attended the Annual Meeting at CATIE in Costa Rica in February 2009 and explored collaborative opportunities.

Al York was a co-leader of a study-abroad Maymester course on Organic Agriculture that went to Italy in May-June of 2009. The class of eleven students investigated the way organic and conventional Mediterranean crops and livestock (and livestock products) are grown, processed (manufactured), and marketed in Eastern Sicily and the mainland area of Italy between Naples and Rome. Examples included blood oranges, peaches, tomato, peppers, salad crops, woody ornamentals, orchids, sheep and water buffalo cheese and milk products, and wine. They also learned about soil management. An additional portion of the trip involved the relatively new business of agrotourism, intended to bring non-agricultural people to rural areas and farms to enjoy the countryside and locally grown, processed, and cooked foods.

Food Science (FS)

James BeMiller taught a 12-hour short course titled "Introduction to Structures and Properties of Polysaccharides" at the National Taiwan University during the 2008 fall semester. The course was offered in the Department of Agricultural Chemistry, but included students from other departments and programs. The course had over 50 participants. BeMiller also presented two seminars during his time there titled "Origins of Channels in Starch Granules" and "Writing and Submitting Manuscripts."

Arun Bhunia gave invited talks in Scotland, Korea, India, The Netherlands, and France during the past year. Titles follow: "Multipathogen Detection Strategies Using Biosensors" (Aberdeen, Scotland, UK); "Biosensor Based Methods in Food Safety and Biosecurity Applications" (Jeonju, Jeonbuk, Korea); "Pathogen Detection: From Conventional to Nanobiosensor Approaches" (Delhi, India); "Biosensors and Bio-Based Methods for the Separation and Detection of Foodborne Pathogens" (Noordwijkerhout,

The Netherlands); and “Pathogen Detection Technologies” (Paris, France).

Christian Butzke traveled to Thailand in November 2008 to witness the PhD defense of Jutaporn “Pa” Swangkeaw, who had been a visiting scholar in his enology lab the year before. Dr. Swangkeaw hails from Khon Kaen University, the largest university in the northeastern part of Thailand, very successfully run by president and Purdue alumnus Dr. Sumon Sakolchai who was delighted to be presented with a Boilermaker statue.

Li-Fu Chen led a group of nine graduate students on a two week study trip to China in June 2009. The students visited multinational food and ingredient companies to better understand the business and technological operations of such companies. The goal is to make these students more marketable and effective as employees in these types of companies.

Kevin Keener was an invited speaker and panel expert for Good Hygiene Practices and Small-Scale Food Processors at the Asian Productivity Organization (APO) conference in Bangkok, Thailand, held Sept 8–13, 2008. The weeklong workshop included 80 government officials and food manufacturers from 13 Asian countries.

Kee Hong Kim helped establish a Letter of Intent between Department of Food Science, Purdue University, and the Education & Research Center for Advanced Bio-Agricultural Technology at Chungbuk National University (CBNU), Korea, which was signed October 2008. Since 2007, Kim has trained two visiting graduate students from CBNU (Mrs. Sung Kee Cho and Jin Seok Moon) in his laboratory on techniques in biochemical and cellular study of adipocyte differentiation.

Mark Morgan attended European Hygienic Engineering and Design Group (EHEDG) meetings in Valencia Spain in October 2008. Morgan was appointed as the chair of the U.S. EHEDG Section.

Philip Nelson served as the keynote speaker at the 6th Global Knowledge Millennium Summit “BIO NANO: The Global War on Hunger” in New Delhi, India, in February 2009. Nelson also gave a talk “A Career with International Implications” in Nippon Del Monte, Gunma, Japan, in January 2009.

Forestry and Natural Resources (FNR)

Maria S. Sepulveda and *Reuben Goforth*, in collaboration with Hugo Ochoa-Acuña (Purdue Veterinary Pathobiology), organized a short course for delivery at the Universidad Nacional, Costa Rica. The short course, “Ecotoxicology and Environmental Risk Assessment” was presented June 22–26, 2009, in Heredia, Costa Rica. A total of twenty students registered for the course. The course covered diverse topics ranging from evaluation of risk to assessment of the effects of pollutants to terrestrial and aquatic organisms. Lectures were coupled with field and laboratory exercises. The course was mostly given in Spanish.

Horticulture and Landscape Architecture (HLA)

Bruce Bordelon and the Purdue Wine Grape Team led a group of fifteen vintners from Indiana and Michigan on an international extension trip “Italy for Wine Professionals” in May 2008 to study farming and production practices in the world’s largest wine-producing country, particularly in regions similar to Indiana. The international contacts developed as a result of this endeavor will allow the Purdue Wine Grape Team to offer a new “Grape Sensory Analysis Workshop” that will involve their Italian extension counterpart.

Ray Bressan was an invited speaker at numerous international universities and scientific symposia during 2008–9 on topics surrounding the role of plant stress genes in drought and salinity tolerance and the identification of such genes by reverse and forward genetic screening methods. Presentations were given at China Agricultural University, Beijing, China; Plant Genetics Institute, Shijiazhang, China; Gyeongsang National University, Jinju City, Korea; Tsinghua University, Beijing, China; King Abdulla University of Science and Technology (KAUST), Jeddah, Saudi Arabia. Bressan is co-director of the recently formed Center for Plant Stress Biology at KAUST.

Michael Dana has continued his departmental leadership of the HORTECUS Program (HORTiculture in EC and US). This consortium of seven horticulture departments from universities in the United States and European Union facilitates student and faculty exchange programs and international course development. Participant institutions include TEI (Crete), Hogeschool Delft (Netherlands), KVL (Denmark), and the University of Hannover (Germany) as

Horticulture and Landscape Architecture continued

well as three U.S. universities (Alabama A&M University, Oklahoma State University and Purdue University). In addition to their cultural diversity, the cooperating educational institutions' geographical locations provide a unique palette of horticultural industries, and thus experiential opportunities, for exchange students and faculty to interact.

Michael Dana and *Rosie Lerner* led a group of nearly 30 Purdue Extension Master Gardeners and horticulture enthusiasts on an 11-day study program of garden design to some of the most famous and intricate gardens in France, including Versailles, the Rosarie de l'Hay du Val de Marne, the International Festival of Gardens at Château Chaumont sur Loire, and Monet's Garden at Giverny.

Natalia Dudareva was an invited speaker at numerous international universities and scientific symposia during 2008–9 on topics related to the biosynthesis of plant volatile compounds. She made presentations on the regulation of metabolic networks that control the emission of floral volatiles as well as on work that has led to both gene discoveries and the resulting practical applications. Invited lectures were given at Nanjing University, China; China Agricultural University, Beijing, China; Kunming, China; Banff, Canada; Barcelona University, Spain; Cartagena, Spain; the Australia National University, Canberra, Australia; Tokyo, Japan.

Jules Janick served as a member of the review team and rapporteur for the ISAFRUIT project of the European Union. He also was a member of the review team for the Swedish University of Agriculture (SLU), Uppsala, Sweden. Janick serves as a Board Member of the International Society for Horticultural Science and Scientific Editor of *Chronica Horticulture*.

Roberto Lopez joined Cliff Sadof, Tamara Benjamin, and Janna Beckerman in 2009 in their collaborative effort with the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Costa Rica to expand the clean stock program into the floriculture, nursery, and pineapple industries.

Peter Hirst, *Roberto Lopez* and *Liz Maynard* conducted management training sessions for Indiana, Texas, and Tennessee National Guard troops who will be stationed in Afghanistan. They offered intensive workshops on fruit-tree orchard management, greenhouse management, and vegetable production, respectively.

Matt Jenks received a Fulbright Fellowship to study at the Agricultural University of Athens, Greece, with Dr. Penelope Bebeli during 2009. The prestigious fellowship will allow Jenks to advance his work on cuticle traits that influence postharvest shelf life in pepper fruit as well as to evaluate and summarize recent advances in crop breeding for stress tolerance.

Mike Mickelbart presented a seminar on fertilization of nursery crops to a group of growers and scientists in the Ontario nursery industry sponsored by the University of Guelph; Vineland Research & Innovation Centre; and the Landscape Ontario Horticultural Trades Association, Toronto, Canada. In February 2008, he provided educational programming for members of the Indiana Nursery and Landscape Association in the Dominican Republic on tropical plants and landscapes for landscape companies with business in Florida. In March 2008, he met with faculty of agriculture of Zamorano University, Tegucigalpa, Honduras, to discuss study-abroad linkages between HLA and Zamorano.

Mickelbart also participated as an invited speaker at the November 2008 meeting of the Multinational Agricultural Research and Development (MARD) Program in Amman, Jordan, where he presented talks on water-use efficiency and abiotic stress tolerance in field crops. The conference provided the opportunity for exploration of inter-institutional cooperation with Hebron University, Hebron, The Palestinian Territories, as well as with The Volcani Center, Rehovet, Israel, where Mickelbart presented additional seminars on the role of stomatal traits in water-use efficiency and crop performance.

Angus Murphy's research program focuses on the regulation of hormone transport in plants as well as on the mechanisms underlying plasma membrane peptide processing. These fundamental questions also have applied aspects, including modifications of plant architecture that may enhance nutrient efficiency, herbicide tolerance, and production of biomass for biofuels. Like many other research programs in HLA, this effort is highly international in focus and has resulted in numerous invitations to speak at academic institutions and scientific meetings in 2008–9, including: IBT UNAM, Cuernavaca Mexico; Society for Experimental Biology Glasgow Scotland; Auxin and Cytokinins in Plant Development Prague, Czech Republic.

Kashchandra Raghothama participated in an international workshop sponsored by the McKnight Foundation on improving phosphate efficiency and aluminum tolerance in maize and sorghum held at Moi University, Eldoret, Kenya, in July 2008. He also traveled to Vienna, Austria, in August of 2008 to serve as research advisor for the IAEA-CRP (collaborative research program) on abiotic stress for scientists from developing countries. This research program was sponsored by the International Atomic Energy Agency (IAEA), Vienna. The following February he returned to Vienna as an invited speaker at the International Plant Stress Conference, and also visited IAEA to discuss international training opportunities for scientists from developing countries.

In September, Raghothama presented research seminars and lectures at Nanjing Agriculture University in Nanjing, China Agriculture University in Beijing, and Zhejiang University in Hangzhou. He returned to China in May 2009 as an invited speaker at the 7th PSILPH Symposium held at the South China Agriculture University (SCAU), Guangzhou, China. He again visited Nanjing Agriculture University (NAU), Nanjing; Zhejiang University, Hangzhou; and China Agriculture University, Beijing, to present seminars at NAU and have discussions with international directors and deans on student exchanges and research collaborations.

In March 2009 he was an invited speaker at the Dalia Greidinger Memorial “Symposium on Crop Production in the 21st Century: Global Climate Change, Environmental Risks and Water Scarcity” held in Haifa, Israel. During this trip he also held discussions on potential research and engagement collaborations in the region with Jordan, Palestine, and Israel. He visited the Spring Valley Research Center, Beit Shean, Israel, and the Palestinian Hydrology Institute, Ramallah.

From the Middle East he traveled to India to participate in the Indo-U.S. workshop on Agribusiness in New Delhi. He presented a seminar at Jawaharlal Nehru University (JNU), Delhi, and held discussion on international engagement with the Director of IARI and Deputy Director General of ICAR.

Youth Development and Agricultural Education (YDAE)

Mary Pilat traveled to Kenya as an invited consultant and observer by SAPTA (Support for Addiction Prevention and Treatment in Africa). SAPTA is a non-governmental organization focused on prevention of chemical addictions in Africa through treatment, and recovery between addiction and HIV/AIDS. Pilat assessed SAPTA's outreach to alcohol-addicted HIV/AIDS patients in Kibera, Africa's largest impoverished area.

B. Allen Talbert and *Dan Gottschalk* led eleven students on an international study-abroad undergraduate teacher preparation course in agricultural education in Jamaica. The Maymester course was headquartered at CASE, the College of Agriculture, Science, and Education in Port Antonio, Jamaica. This was the fifth year of the course, which has had 59 students total.

Roger Tormoehlen and graduate student *Jiajiang Peng* represented Purdue University at the annual conference for the Association for International Agriculture and Extension Education in San Juan, Puerto Rico, May 2009. Jiajiang presented a paper on his research project to identify the key factors that impact potential business relationships with between United States and China companies.

Roger Tormoehlen, *Mark Tucker*, *Neil Knobloch*, and *Jiajiang Peng* from YDAE, along with Kira Everhart-Valentin (IPIA), visited China for two week in October 2008. The goals of the trip were: 1) identification of specific research faculty committed to establishing a conceptual extension model for China and enthusiastic about long-term partnerships with Purdue University faculty; 2) assessment of China's human and technical capacity for initiating and sustaining an extension model for effective rural and youth development; 3) determination of the educational needs of China's rural population; and 4) identification of specific human contacts in the cultural, political, agricultural, and financial sectors for establishing a Purdue University study-abroad program.

During the trip the delegation met with administrators at China Agricultural University in Beijing, Northwest A&F University in Yangling, and Sandia University in Shanghai.

Youth Development and Agricultural Education continued

Lee Stanish, graduate assistant, provided oversight and coordination for the following international-related 4-H activities.

Twenty-four Japanese youth ranging in age from 15–18 and three adults spent four weeks in Indiana as part the Purdue/Meiji Gakuin Summer 4-H International Program. This 4-H-based International Exchange Program is to provide a “glimpse” into the everyday life of American families while developing lasting friendships and cultural bridges for Indiana youth. Each Japanese participant stayed with an Indiana host family during the exchange.

During June 2009, 16 Polish youth and 10 adults visited Indiana as part of the annual Indiana/Poland 4-H youth exchange program. The program allowed the Polish delegation to study Indiana and U.S. agriculture, experience American’s culture and heritage, and learn about 4-H in Indiana. Each Polish delegate spent two weeks with his or her Indiana host family. The Poland program, now in its

fifth year of operation, has exchanged 115 youth and leaders between Indiana and Poland.

Three Indiana 4-H youth applied and were accepted for one-month international education programs. Lexi Buchs and Michelle Bischoff (from Dekalb and Dearborn Counties respectively) traveled to Australia in June. Their stay included living on an Australian livestock farm and visiting major Australian cities and sites. Sarah Nixon from Allen County traveled to Japan in early July for her educational program. Her stay included living with a Japanese host family and time visiting cultural sites in Tokyo.

Thirty-eight Indiana 4-H junior leaders from Parke, Pulaski, LaPorte, and Bartholomew Counties were able to learn more about world food and hunger issues with a three-day experiential learning camp at Heifer International. Located in Arkansas, Heifer is a nonprofit focused on serving the world’s poor through sustainable animal agriculture. Heifer’s mission expands to education by using their 1,200 acre ranch as a global learning outdoor camp for youth. www.heifer.org

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