

Perspectives

Spring 2014

NBAF rendering

Current and planned global food systems facilities:

- National Bio and Agro-Defense Facility
- Biosecurity Research Institute
- USDA-ARS Center for Grain and Animal Health Research
- Kansas Department of Agriculture headquarters
- International Grain Complex

Feeding a need

Kansas State University steps up to lead in Global Food Systems

Scan with smartphone for video about the Global Food Systems initiative.



The tech sector and Silicon Valley are synonymous. The Research Triangle embodies biotech and life science innovation.

Where is the world's nucleus of global food systems? Kansas State University leaders and experts will tell you they're in it.

"Kansas State University is already a global leader among research universities in addressing the world challenge of feeding a growing population," said Kirk Schulz, Kansas State University president. "With the imminent construction of the \$1.2 billion federal National Bio and Agro-Defense Facility on the Manhattan campus, the window is open to claim the global leadership position in global food systems."

Many universities and entities stood at attention with the United Nations' prediction that the world population will reach 9 billion by 2050. Kansas State University is snapping into action because of another prediction: The expected doubling of the number of people entering the middle class by 2030.

These young and middle-aged adults will expect a middle-class lifestyle, which includes

a safe, higher-quality diet that contains more animal protein. Additional food animals will require greater amounts of grain. However, limitations on arable land, water, the working age population and other resources may not allow producers to keep pace with demand if they only have existing technologies.

That's where the university can step in. For 150 years, Kansas State University has been enmeshed in the food system from farm to fork. Today, the Biosecurity Research Institute represents a tremendous asset when

striving for global leadership, said Ron Trewyn, vice president for research.


"The co-location of a biosafety level-3 facility and a biosafety level-4 facility creates one of the world's greatest concentrations of facilities for research in animal health, crop protection and food safety," Trewyn said.

Construction on the NBAF facility's Central Utility Plant continues.

— Erinn Barcomb-Peterson



1. Hal Ross Flour Mill 2. O.H. Kruse Feed Technology Innovation Center 3. Kansas Wheat Innovation Center 4. Bioprocessing and Industrial Value Added Program 5. International Grains Program Conference Center



Food for all

Three federally funded labs at the university focus on ending global hunger

Kansas State University's College of Agriculture had a banner year in 2013.

Beginning in July, Kansas State University was the recipient of three highly competitive grants totaling more than \$27.2 million from the U.S. Agency for International Development, or USAID. The grants establish and fund three of the federal agency's Feed the Future Innovation Labs at the university.

Feed the Future labs are a global collaboration among universities, industry and nongovernmental organizations. Labs focus on improving the resiliency and production of food crop plants as well as preventing crop losses in key, grain-producing countries in an effort to end world hunger.

"These federal centers are highly competitive amongst universities with strong agriculture programs," said John Floros, dean of the College of Agriculture and director of K-State Research and Extension. "The labs require not only a great deal of expertise, but also leadership in coordinating research. Kansas State University is proud to lead these efforts to improve our global food systems and help find solutions to feed the world's growing population."

Kansas State University's innovation labs are concentrating on wheat, sorghum and millet, and reducing postharvest losses through a combination of research, education and outreach in target nations.

The Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet focuses on the African nations of Ethiopia, Senegal and Niger. Experts are using science and technology to produce innovations such as climate-resilient varieties of sorghum and millet as well as more profitable market approaches for the farmers in the three target nations.

"The overall goal with those three key producing nations is to improve farmers' productivity with sorghum and millet, which will reduce poverty and hunger," said Timothy Dalton, associate professor of agricultural

economics and the lab's director. "Additionally, we want to help the farmers with value-added product development to increase benefits to consumers, the private sector and farmers."

The Feed the Future Innovation Lab for Applied Wheat Genomics is working to develop wheat varieties that are resilient to the warming effects of climate change. Initially, the concentration will be in South Asia, which typically produces 20 percent of the world's wheat crop.

"Globally, wheat production is increasing at a rate of 1 percent annually, but there is evidence of yield stagnation in some regions, including South Asia," said Jesse Poland, research geneticist with the U.S. Department of Agriculture and an adjunct assistant professor of agronomy. "In fact, climate models predict that in tropical and subtropical regions such as South Asia, yield will decrease by 10 percent for every 1 degree rise in temperature. Given current cultivars and production practices, this would likely reduce production levels by 30 percent in these regions."

The Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss will focus initially on helping the countries of Bangladesh, Ethiopia, Ghana and Guatemala reduce their postharvest losses and food waste for grain and oil seed crops, tuberous root crops, and peanut and legume crops.

"A tremendous amount of time and effort is being put into improving crop yields in the developing parts of the world, but then 20-30 percent of those crops are lost soon after harvest and before they reach the consumer," said Dirk Maier, professor and head of the grain science and industry department and director of the university's international grains program.

These innovation labs segue into the university's larger food security research effort, the Global Food Systems initiative.

— Greg Tammen



Preventing postharvest food loss

Scan with smartphone for video about how
we're meeting global food challenges.



In a partnership with U.S. Agency for International Development, or USAID, Kansas State University will be home to three Feed the Future innovation labs, one of which aims to find ways to reduce food loss and preserve the natural resources used to produce food.

Imagine taking a trip back in time more than 70 years to the beginning of what many call the "Green Revolution." It was a time when the world population doubled, forcing the agricultural industry to grow rapidly with the population to prevent starvation.

John Floros, dean of the College of Agriculture and director of K-State Research and Extension, said since the beginning of the Green Revolution, the world's food and agriculture system grew to produce two-and-a-half times more food, with the same natural resources, to feed 7 billion people.

Despite growth in agricultural production, however, the United Nations Food and Agriculture Organization,

or FAO, reports that today nearly 870 million of the 7 billion people in the world, or one in eight, suffer from chronic malnourishment. Floros, a renowned food scientist, said preventing food loss is a key component to feeding those hungry in the world today and to prepare to feed a larger population — more than 9 billion projected by 2050 — in the future.

As much as a third to half of the world's harvest is lost every year for many reasons, he said. While much of the food in the U.S. is allowed to go bad and tossed out in homes, grocery stores and restaurants, many developing countries don't have preservation technologies in place, and food loss at the farm level is the major concern.

"Most of that loss takes place because they don't have the technology, transportation means and ability to preserve the material," Floros said. "So they lose it to rodents, microorganisms, moisture and a number of different reasons that technology can resolve."

K-State is in a position to find solutions in this area, as it is receiving an initial five-year, \$8.5 million award from the USAID to establish the federal government's new Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss. The lab is the third Feed the Future Innovation Lab established at K-State, joining the Sorghum and Millet Innovation Lab and the Applied Wheat Genomics Innovation Lab.

In addition to research aimed to keep foods secure from pests and microorganisms, the lab will be examining best storage techniques, improving nutrition in foods and providing farmers with the knowledge and technologies needed to help preserve a safe food supply.

If we were able to minimize that loss, minimize that waste, then we don't have to waste the resources to grow those crops and animals, and everybody wins, Floros said. The consumer wins. The system itself wins. The environment wins. The planet wins.

— Katie Allen

Scientific advancements

The American Association for the Advancement of Science — the world's largest scientific society — recently named four Kansas State University faculty members as fellows.



Walter Dodds, university distinguished professor of biology, was named for his distinguished contributions to research and education in

freshwater ecology and environmental sciences, particularly for advancing the understanding of nutrient dynamics and pollution in streams.

Dodds is a freshwater ecology expert. He has studied the effects of nitrogen contamination in stream waters and the effects stream drying and flooding have on the habitat and species that live in streams.



Donald Kaufman, professor of biology, was honored for his distinguished contributions to mammalian ecology, in particular for novel long-term experimental studies

of fire, grazer and weather impacts on small mammals in native prairies.

Kaufman specializes in mammalian ecology. Since 1981, he has conducted studies on the small mammal populations at the Konza Prairie Biological Station, looking at

the effects of fire and grazers on the prairie rodents and shrews, the effects of woody invasion on prairie mammals, nongame wildlife conservation and prairie ecology.



John Leslie, university distinguished professor of plant pathology and head of the plant pathology department, was named a fellow for

pioneering genetics of the fungal genus *Fusarium*, for leading laboratory and scientific writing workshops worldwide, and for service as department head.

Leslie is one of the world's leading experts on devastating fungi in the *Fusarium* genus. These fungi cause billions of dollars in losses annually from plant diseases and through the production of mycotoxins, which can sicken and kill humans and domesticated animals. He specializes in biochemical, molecular and population genetics of model and plant pathogenic fungi.



John Reese, professor of entomology, was recognized for his distinguished contributions to entomological sciences, particularly in the fields of plant-insect

interactions and plant resistance to insects.

A study published in the Proceedings of the National Academy of Sciences by a student he co-advised demonstrated the ability to silence a gene that is expressed in

aphid salivary glands. One-hundred percent of the aphids in which the gene had been silenced died when placed back on their host plant, leading to a better understanding of RNAi host plant resistance and a step forward in transgenic safety.

— Greg Tammen

Entomology department ranks No. 8 in nation

The U.S. National Research Council has ranked Kansas State University's entomology department No. 8 in the nation. The council's rankings are based on responses to questionnaires filled out by faculty, students and administrators at cooperating institutions.

The ranking puts K-State's entomology department higher than schools such as Cornell University, Purdue University and Auburn University.

Faculty members specialize in plant resistance, integrated pest management, stored-product entomology and molecular entomology.

The department is among several K-State programs to rank highly with the council.