



United States
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National Institute
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Advancing U.S. Agriculture Through Global Engagement

National Institute of Food and Agriculture (NIFA) grantees are including international activities as an effective way to help achieve research, education, and extension objectives important to U.S. agriculture. Only U.S. institutions can receive NIFA grants, and any international activities must advance U.S. agriculture. The NIFA-funded projects described here are examples of how U.S. researchers and faculty through international collaborations and activities are achieving results valuable to the U.S. and the world. These projects help promote U.S. agriculture, advance trade, serve U.S. food security and food safety needs, and foster collaboration to address mutual interests within the global agricultural science community.



Entomological Studies of Zika Virus Transmission in Haiti

Zika Virus (ZIKV) has emerged in the Americas where susceptible populations of new vectors of transmission may arise and the disease may spread more rapidly. To fully understand the range of mosquito species capable of transmitting ZIKV in the Americas, University of Florida researchers studied ZIKV transmission in Haiti, with an objective to determine the frequency of Zika infection in wild-caught mosquitoes, and in mosquitoes stored from previous collection. What was learned in Haiti could be applicable to Florida and other southern states of the U.S. due to the similarity of mosquito species.

AFRI grant



Broadening Students' Experiences and Expanding their Career Competencies through International Experiential Learning Opportunities

Faculty at Texas A&M University (TAMU) and Prairie View A&M University (PVAMU) teamed to broaden their students' academic experiences and career competencies through a faculty-led study abroad program in Namibia, partnering with the University of Namibia and Namibia-based research centers. Recruiting students traditionally underrepresented in study abroad programs was an important objective. Faculty included Namibians' knowledge of community-based natural resource management strategies, and how to use these strategies to address food security issues. TAMU and PVAMU faculty with colleagues in Namibia developed course materials, and aimed to integrate learning from the study abroad experience into courses back at their universities. **HEC grant**



Expanding U.S. Market Access in China's Evolving Agricultural and Trade Policy Environment

To gain an understanding of China's agricultural trade policies and promote U.S. market access to China, a team from Virginia Polytechnic Institute (Virginia Tech) researched U.S. market access under China's evolving agricultural and trade policies. Working with Chinese collaborators, they traveled to China to interview both Chinese and U.S. leaders in agribusinesses, government agencies, and universities to determine trade constraints, regulations and other impediments to U.S. agricultural exports. This research will provide U.S. agribusinesses and agricultural exporters with knowledge to evaluate potential risks and opportunities caused by differential agricultural and trade policies and help U.S. agribusinesses expand market access into China. **AFRI grant**



Development of Woody Landscape Cultivars

People love ornamental plants that exhibit drought tolerance, provide environmental and ecological benefits, and have low maintenance requirements. Asian countries, especially China, have rich resources of ornamental plants. Plant breeders at the University of Georgia to strengthen the ornamental industry are developing new woody ornamental plant cultivars that thrive in drought and other environmental conditions. Their research includes collecting germplasm from plant species growing under extreme conditions. Two *Ilex* (holly) species growing under extreme conditions were collected from China and germinated. The Georgia researchers will test both species for their performance under drought and flooded conditions and use them for breeding lines. **HATCH grant**

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Biology and Management of Potato and Sugarbeet Diseases

Potatoes, a major agricultural commodity in North Dakota, have an impact on U.S. potato production markets for seed, processing and tablestock. An objective of this research by North Dakota State University's (NDSU) potato breeding program was to develop disease free potato cultivars with enhanced disease resistance. Varieties and selections were screened for resistance to powdery scab caused by *Spongospora subterranea*; several selections, including the cultivar Karu from Chile, were found to have good resistance. NDSU collaborates in potato research with INIA, Chile's main agricultural research institution. **HATCH grant**



NIFA-BARD: Enhanced Resilience of Local Agricultural Water Supplies through the Reuse of Municipal and Agricultural Wastewater: A Dynamic Economic Analysis

Water scarcity and climate uncertainty is causing growers and irrigation districts to consider augmenting current water supplies with agricultural drainage water (ADW) and treated wastewater (TWW). Scientists from the University of California, Riverside, and from Israel (a country experienced with TWW) investigated the most efficient manner reuse of ADW and TWW which would help agriculture reliably receive the water it needs. The objective is to develop a regional water reuse decision-support model that can evaluate the impacts of using treated ADW and TWW on agricultural sustainability and water supply reliability. A model relevant to wastewater regulations in California has been finalized. **AFRI grant**



Cereal Quality and Biochemistry

To develop the resources needed for breeding high yielding, high quality cereals under drought conditions, researchers at Montana State University and Bielefeld University in Germany studied the genetic basis of how drought affects aging (senescence) and grain quantity and quality in cereals. They collaborated with a laboratory at the Weizmann Institute of Science in Israel, whose expertise in cysteine proteases (enzymes that remobilize nitrogen from senescing leaves to developing grains) was important in understanding the process of senescence in barley, and in establishing a physiological basis for breeding efforts to improve barley performance. **HATCH grant**



Developing the Tools and Germplasm for Hybrid Wheat

Wheat yields will need to increase to feed a larger global population with increasing dietary needs. To improve wheat production, faculty from the University of Nebraska-Lincoln, with collaboration from the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, Texas A&M University, the University of Hohenheim (Germany), Kansas State University, and Genetics and Crop Plant Research – IPK (Germany), conducted research to develop the necessary knowledge-base, germplasm, and heterotic pools to support the development of hybrid wheat. This project, a part of the NIFA's participation in the International Wheat Yield Partnership (IWYP) is expected to help create the scientific and germplasm foundations for successfully launching the hybrid wheat industry in the United States. **AFRI grant**



Strengthening U.S. Agriculture with Multidisciplinary International Undergraduate Research and Extension Experiences

The University of Tennessee is bringing together 14 undergraduate students and 10 mentors in a 3-year experiential research and extension project to investigate smallholder farms practicing conservation adjacent to the Vaca Forest Reserve in Belize. They will conduct projects on crop production and soils; social and economic systems; and wildlife, forestry, and ecosystem services. An agro-ecological approach will be used to foster systems-level thinking and develop transdisciplinary skills. Their goal is to develop leaders in agriculture and natural resources research and extension who can synthesize the complexity of agricultural systems to keep U.S. agriculture at the forefront of addressing sustainable global food security. **AFRI grant**



U.S.-U.K. Collaborative Research: Host Resistance to Avian Pathogenic *E. coli*

Avian colibacillosis, a disease caused by the bacterium *Escherichia coli* (Avian Pathogenic *E. coli* - APEC) is responsible for much mortality in poultry flocks. Scientists from Iowa State University and the Roslin Institute, University of Edinburgh (United Kingdom) formed a collaborative research team, leveraging their respective expertise in poultry immunology, genomics, and microbiology. The goal was to reduce the impact of APEC on the poultry industry in the United States and the United Kingdom through development of complementary veterinary and breeding control strategies based on a thorough understanding of host functional response to *E. coli* infection. **AFRI grant**

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Engage Students and Faculty in Latin American Agriculture as a Model for Global Involvement and Career Development

Training future leaders with a good understanding of global food and agriculture issues is important, but study abroad opportunities for minority students in agriculture are limited. Delaware State University, Alabama A&M University and Tuskegee University addressed this by developing a faculty-led student research and study abroad program in Costa Rica at CATIE, a world-renowned institution in sustainable agriculture research. Their program of student experiential learning included the role of agroforestry in sustainable management; organic production in tropical conditions; and communities' preparedness to cope with climate change. Students interacted with rural communities and appreciated a different lifestyle and the Spanish language. **1890 grant**



Evolutionary Ecology of Agricultural Plants

In southern Mexico, a center of crop diversity for the crops maize and chile, researchers from Ohio State University are exploring the geographic patterns of molecular and quantitative genetic diversity, plasticity, and local adaptation of landraces of these crops. Clarifying how crop diversity has responded to selection in the past (e.g., during domestication) and continues to respond, will help reveal the capacity of crops to adapt to future climates. This research can help in understanding how to adapt U.S. agriculture to climate change by managing crop genetic resources. **HATCH grant**



Investigating Diversity as a Climate Resilience Strategy for Potato and Grain Systems using DSSAT and Collaborative Modeling

To produce actionable information for farmers and farm advisors in Maine about likely vulnerabilities of current potato and grain production systems to climate change and weather variability, a University of Maine faculty member had as a sabbatical goal gaining proficiency in the DSSAT cropping systems simulation model. Working at the Agricultural Research Institute of Chile with a colleague there who was expert in the ecophysiology of potatoes and grain crops and in using DSSAT they calibrated and evaluated the model for a popular variety of potato in Chile. Back in Maine, the faculty member applied the new skills in DSSAT to calibrate and evaluate the model for potatoes and grains in Maine. **AFRI grant**



Biology and Management of Plant-Associated Viruses and Endophytic Fungi in New Mexico

Regarding endophytic fungi: Locoweeds (found globally) are leguminous plants which are toxic to grazing animals due to consumption of swainsonine, an alkaloid produced by fungi which live endophytically inside the locoweed plants. Scientists at New Mexico State University are working with Chinese scientists to compare locoweed endophytes in China to those found in the western United States. Fungal endophytes and locoweed plants will be characterized biologically and molecularly. By better understanding the fungi and their interaction with their plant hosts, New Mexico State University scientists hope to develop options to help rangeland managers avoid or control the problem of livestock poisoned by locoweed. **HATCH grant**



Risk Assessment and Eradication of *Globodera* in U.S. Production of Potato

The U.S. potato industry depends upon the ability to respond in a quick, economical, and environmentally sound way to invasive agricultural pests such as cyst nematodes in the genus *Globodera*. The University of Idaho formed a consortium of researchers, extension specialists, and educators from three land-grant institutions (U. of Idaho, Oregon State University, Cornell University), USDA Agricultural Research Service, and international experts (James Hutton Institute, Scotland; INRA, France; Agriculture and Agri-Food Canada). The objective is to increase the capacity of the U.S. to respond to the threat of *Globodera* in potato production because potato is the most important non-grain food crop in the world. **AFRI grant**



Managing Plant Microbe Interactions in Soil to Promote Sustainable Agriculture

Lettuce drop is a destructive disease caused by a fungus (*Verticillium dahliae*) that causes lettuce leaves to wilt and drop to the soil surface. The University of California, Davis, with collaboration from the California Leafy Greens Research Board, and Bayer Crop Sciences in Germany is researching how certain soils are able to suppress lettuce drop and other diseases caused by *Verticillium* spp. They applied a metagenomics, high-throughput DNA sequencing approach to identify the soil-borne microbes that eliminate *Verticillium* wilt symptoms in lettuce grown in California's Salinas Valley. Ultimately, this knowledge will aid in the development of strategies to manage *Verticillium* wilt throughout the world. **HATCH grant**

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Building Teaching, Research, and Extension Capacity at UAPB to Enhance Global Learning and Strengthen Sweet Potato Production in Guyana and Arkansas Delta

The University of Arkansas at Pine Bluff (UAPB) is pursuing multiple objectives of training their graduate and undergraduate students in germplasm development research, developing insect-resistant sweet potato lines, and improving extension on sweet potato production, through their research activities in Guyana. Research by scientists and students from UAPB and Guyana includes virus indexing, selecting sweet potato elite parental lines with resistance to insects and viral diseases, and developing hybrids and testing them at different locations in Guyana and UAPB. Results will benefit farmers on the Arkansas delta and in Guyana. **1890 grant**



Preventing the Spread of Cattle Fever in Texas: Using Population Genetic Tools to Increase the Effectiveness of Disease Management Efforts

Tick populations in Mexico transmitting cattle fever can be a deadly threat to cattle in Texas. Northern Arizona University researchers with collaboration from Mexican scientists are using tick collections from the U.S. and Mexico and DNA fingerprinting to reveal how ticks are moved into Texas, and to define the genetic background of cattle fever ticks in Mexico. To understand the source of tick infestations in the region, it is crucial to understand the population structure of tick species in Mexican states that export cattle to the United States. Findings will be provided to USDA Animal and Plant Health Inspection Service personnel to improve their existing efforts to control and eradicate cattle fever ticks. **AFRI grant**

Key for NIFA Grant Programs cited:

AFRI grant - Agriculture and Food Research Initiative competitive grant program

HEC grant – Higher Education Challenge competitive grant program

1890 grant – 1890 Institution Capacity Building Grant competitive grant program

HATCH grant – Hatch Act of 1887



U.S.-U.K. Collab: Mycobacterial Transmission Dynamics in Agricultural Systems: Integrating Phylogenetics, Epidemiology, Ecology, and Economics

Researchers at Cornell University formed a collaborative with scientists in the United Kingdom (U.K.) to investigate mycobacterial transmission in agricultural systems. Their objective was to develop a quantitative methodology for incorporating whole genome sequence data into bacterial transmission models for infectious diseases, integrating ecology, economics, molecular biology, and epidemiology. Due to their valuable collections of data and isolates in the U.S. and the U.K., with experts across multiple scientific fields, the team was able to apply these methods and models to better understand the principles and dynamics governing transmission of mycobacterial infection. **AFRI grant**

Learn More About NIFA's Opportunities for Global Engagement

NIFA's Center for International Programs establishes connections between NIFA and other organizations, such as the U.S. Agency for International Development (USAID), Food and Agriculture Organization of the United Nations (FAO), CGIAR system of international agricultural research centers, and the World Bank; and with agricultural research agencies of other countries to globally advance the results and experience of NIFA and the institutions it serves, and achieve goals important to U.S. agriculture. To find out more about NIFA's international collaborations and opportunities in the different NIFA grant programs visit us on the web:

<https://nifa.usda.gov/program/global-engagement-programs>

- Global Engagement Programs
- Enhancing NIFA's Effectiveness for Global Engagement
- Grant Opportunities for Global Engagement
- Developing Global Partnerships

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All project descriptions in this document are based on reports from the grantees in the USDA Current Research Information System (CRIS) <https://cris.nifa.usda.gov/>