



United States  
Department of  
Agriculture

National Institute  
of Food  
and Agriculture

# USER INSPIRED SCIENCE TRANSFORMING LIVES

**NATIONAL INSTITUTE OF FOOD AND AGRICULTURE  
2017 ANNUAL REPORT**



**NIFA**

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# OUR VISION

Catalyze transformative discoveries, education, and engagement  
to address agricultural challenges.



## A MESSAGE FROM THE DIRECTOR,

It is a great privilege for me to present the 2017 Annual Report of the National Institute of Food and Agriculture (NIFA): User Inspired Science Transforming Lives.

Agriculture Secretary Sonny Perdue articulated a vision that the U.S. Department of Agriculture (USDA) is one family working together to serve the American people. NIFA will help achieve that vision by investing needed intellectual and monetary resources in alignment with USDA's seven strategic goals to ensure agricultural and rural prosperity.

The Rural Task Force Report includes five indicators of rural prosperity: e-connectivity for rural America, improving quality of life, supporting a rural workforce, harnessing technological innovation, and fostering economic development. NIFA investments contribute to achieving these indicators, particularly quality of life, technological innovations, and workforce and economic development.

Discoveries leading to incremental changes will not be sufficient to deal with the burgeoning population, changing demographics, and the need to ensure nutritional security in the context of changing climate and extreme weather events, diminishing land and water resources, degradation, and changing incomes and diets. Solving 21st century food systems challenges will require revolutionary, transdisciplinary approaches, and require that farm productivity and profitability are promoted.

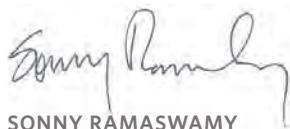
The 2017 Annual Report from NIFA—User Inspired Science Transforming Lives—includes compelling examples of the many NIFA-funded research, extension, and education outcomes. NIFA supports the efforts of a broad range of partners, including academic and science organizations; small business and industry; agencies from all levels of government; and non-governmental, public, and private organizations. NIFA invests funds appropriated by Congress to solve urgent problems in the areas of food safety and security, nutrition and public health, natural resource stewardship, and the bioeconomy. NIFA-funded programs also sustain the workforce pipeline, fuel job growth, and promote economic health.

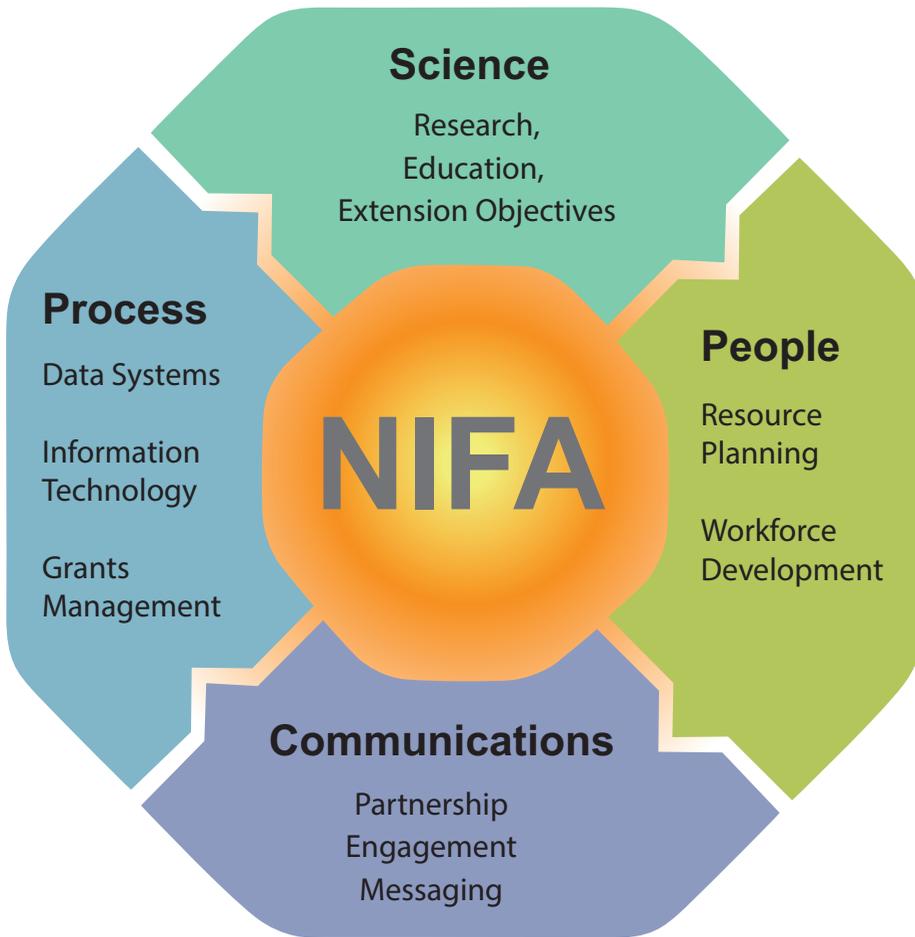
With NIFA support, land-grant and non-land-grant universities, Hispanic-serving institutions, Alaska Native-serving and Native Hawaiian-serving institutions, and institutions in insular areas are developing transformative strategies to solve complex societal problems. Their high-priority projects include protecting the health of pollinators, mitigating antimicrobial resistance, improving water quality and soil health, and combating the effects of extreme weather events. Our partners are transforming agricultural production systems in environmentally responsible ways, mitigating the impacts of extreme weather, advancing the bioeconomy, and ensuring that fiber and nutritious foods are produced in ways that are sustainable, safe, and accessible for consumers here and abroad. The many NIFA-supported educational programs nurture the next generation of farmers, livestock producers, scientists, and other professionals needed in food, agriculture, natural resources, and human sciences.

I am excited about the future of our nation's food and agricultural systems and NIFA's role in supporting the transformative research, extension, and education we need. It is a privilege for me to work with the preeminent academic, governmental, non-governmental, and private sector partners, diverse stakeholders, and the committed and talented professionals at NIFA.



SONNY RAMASWAMY AND AGRICULTURE SECRETARY SONNY PERDUE.

  
SONNY RAMASWAMY



## 2014-2018 NIFA STRATEGIC PLAN GOALS

The work NIFA undertakes is anchored under four strategic goals.

### GOAL 1—SCIENCE:

Catalyze exemplary and relevant research, education, and extension programs.

### GOAL 2—PEOPLE:

Transform NIFA into a model agency with a highly motivated workforce.

### GOAL 3—PROCESS:

Institutionalize streamlined, effective technologies, policies, and processes.

### GOAL 4—COMMUNICATION:

Advance America's global preeminence in food and agricultural sciences.



# AFRI

The Agriculture and Food Research Initiative (AFRI), America's flagship agricultural competitive grants program, supports scientists, researchers, and extension professionals as they seek solutions to our most pressing societal challenges in agriculture, health, food safety and security, and more.

AFRI advances fundamental, new science and translational research and development projects that build on those discoveries. AFRI also supports education and extension programs that deliver science-based knowledge to people, allowing them to make informed practical decisions. These AFRI-supported efforts enable our nation to respond to significant challenges, both here and abroad. Challenges include water quality, adapting to and mitigating the effects of changing climate, restoring soil health, improving food safety and quality, preventing childhood obesity, promoting the bioeconomy, and advancing America's competitiveness internationally. Ultimately, our expectation is that the discoveries, along with the extension and education outcomes, promote farm profitability.

Stakeholder input through requests for applications and public meetings is critically important for the continual improvement of AFRI. More information is available on the AFRI Stakeholder Feedback page of the NIFA website.

**AFRI FY17  
FUNDING:  
\$311.5  
MILLION**

**PROJECTS:  
693**

In FY 2017, Congress appropriated \$375 million for the AFRI program. During FY 2017, NIFA received approximately 2,700 proposals for AFRI grants and, after a peer-review process, made 693 awards. The funded projects focused on the six agricultural priorities of the 2014 Farm Bill:

- Agricultural economics and rural communities;
- Agricultural systems and technology;
- Animal health and production and animal products;
- Bioenergy, natural resources, and the environment;
- Food safety, nutrition, and health; and
- Plant health and production and plant products.

# AFRI IMPACTS

## Preventing the Spread of Cattle Fever

Tick populations in Mexico transmitting cattle fever can be a deadly threat to cattle in Texas. **Northern Arizona University** researchers, in collaboration with Mexican scientists, are using tick collections to determine the genetic sources of tick populations in Texas, and to genotype populations resistant to pesticides. This information is important to prevent a resurgence of cattle fever, which has cost the cattle industry as much as \$3 billion.

## Finding the “On” Switch to Johne’s Disease Immune Response

Johne’s disease is a contagious, chronic, and sometimes fatal infection in ruminant animals that costs farmers and producers millions of dollars every year. **Colorado State University** researchers have identified molecules that may identify the disease in 75 percent of cattle before they are 2.5 years old, the best time to test for Johne’s disease during preclinical stages.



## Helping Save the Salmon

U.S. production of Atlantic salmon has dropped more than 35 percent since 2000, due to an increase in the death rate of salmon embryos. Research at the **University of Maine** shows that female salmon with high levels of two types of hormone produce eggs that achieve an 80 percent survival rate. Researchers are now determining patterns of steroid deposition into the eggs.

## Cow Antibodies May Help Develop AIDS Vaccine

Building on previous discoveries by **Texas A&M University**, scientists are drawing out powerful HIV-blocking antibodies in cows in a matter of weeks, something that usually takes years in humans. Researchers believe that a cow’s ability to produce these antibodies against HIV highlights even broader significance, particularly for emerging pathogens.

## Understanding the Health Benefits of Provitamin A

Nonalcoholic fatty liver disease afflicts 30 percent of men, 20 percent of women, and 3 to 10 percent of children in the United States. Researchers at **Tufts University, Massachusetts**, are investigating the effects of provitamin A, found in sweet red peppers, squash, and pumpkin. Provitamin A may prevent fatty liver and inflammation in 80-90 percent of obese adults, 30-50 percent of patients with diabetes, and 40-70 percent of obese children.

## Food Nanotechnology: Expanding the Parameters of Consumer Acceptance

Nanotechnology is transforming food production, processing, and packaging. Researchers at **Rutgers University, New Jersey**, examined consumer beliefs about the relationship of nanotechnology to healthfulness, among other topic areas. In taste tests, samples were equally liked, regardless of whether they claimed nanotechnology benefits. Both genders were receptive to the idea, but research showed that men were more likely to accept nanotechnology in food.



## Widening the Genetic Base of U.S. Rice Germplasm

Drought and salinity are major climate-related risks for sustainable rice production. Researchers at **Louisiana State University** are designing rice cultivars that target seedling stage salinity tolerance. If successful, this research could enhance food security around the world.

### Genome-Wide Association Identifies Alpine Goats with High Milk Production

Researchers at **Langston University, Oklahoma** are using genome-wide association to identify Alpine goats that produce the most milk. In addition, Langston faculty have developed advanced laboratory techniques and methods of data analysis, which have been used for training and professional development.

### Reducing Ecological Footprint, Saving Money at Clemson

A **Clemson University, South Carolina** researcher created technology that uses data from sensors to determine how much fertilizer is needed in the field and at what time. Being tied to an irrigation system, it also regulates water flow. On-farm trials show savings of up to \$54 per acre by reducing fertilizer applications by nearly two-thirds over conventional applications.

### Highly Productive Corn has Reduced Ability to Adapt

Does acclimating to particular locations change a plant's ability to adapt to new or stressful environments? **University of Wisconsin-Madison** led a team of researchers, including some from the **University of Arizona**, who found that the corn genome has undergone a high degree of selection – for example, genes that contribute to high yield in the environment of a particular location may have a reduced ability to respond in other environments.

### Combining Ground and Aerial Vehicle Networks for Crop Disease Detection

Mechanical and aerospace engineering researchers at the **University of Central Florida** are integrating low-altitude aerial imaging and advanced sensor technologies to enhance early disease and stress detection in fruit and vegetable crops. New detection algorithms provide greater speed and accuracy, and a new detection sensor can detect water stress in its early stage.

### Adapting Chicken Production to Climate Change through Breeding

Heat stress is one of the biggest hazards of chicken production in the United States. Researchers at the **University of Delaware** studied chickens from around the world and mapped genetic markers that may improve heat tolerance. The research also contributed to the "chicken gene atlas," helping to provide basic information for future studies. This work could revolutionize poultry breeding in the United States by reducing the need to manage heat stress in hatcheries and bird houses.

### Robots May Enhance Productivity in Agriculture

Researchers at **Carnegie Mellon University, Pennsylvania**, have created a camera-equipped vehicle that can detect fruit via automated image analysis. Image data gives producers the ability to predict yield well ahead of harvest, which saves them money and time by allowing them to properly prepare for labor, shipping, storage, marketing, and sales.





USDA Photo by Preston Kates

# SCIENCE EMPHASIS AREAS

Stakeholder input is a key driver in determining NIFA's research, education, and extension priorities. This process ensures that user-inspired science that begins in the lab reaches the people who need it—professionals in ag-related fields, educators, and consumers.

NIFA developed, delivered, and evaluated the agency's science objectives through nine Science Emphasis Areas, which are administered by the agency's four programmatic institutes:

- Institute of Food Production and Sustainability (IFPS)
- Institute of Bioenergy, Climate, and Environment (IBCE)
- Institute of Food Safety and Nutrition (IFSN)
- Institute of Youth, Family, and Community (IYFC)

Advancing U.S. agriculture through global engagement is a theme that cuts across all of NIFA's Science Emphasis Areas. NIFA's Center for International Programs works with the four institutes to develop partnerships and collaborations that apply the best science to problems we face, increase our global competitiveness, and maintain U.S. leadership internationally.

## SCIENCE EMPHASIS AREAS

## INSTITUTE

Sustainable Ag Production Systems	IFPS, IBCE, IFSN, IYFC
Education & Multicultural Systems	IYFC
Environmental Systems	IBCE
Family & Consumer Sciences	IYFC
Bioeconomy, Bioenergy, Bioproducts	IFPS, IBCE
Human Nutrition	IFSN, IYFC
Food Safety	IFSN
Agroclimate Science	IFPS, IBCE
Youth Development	IYFC

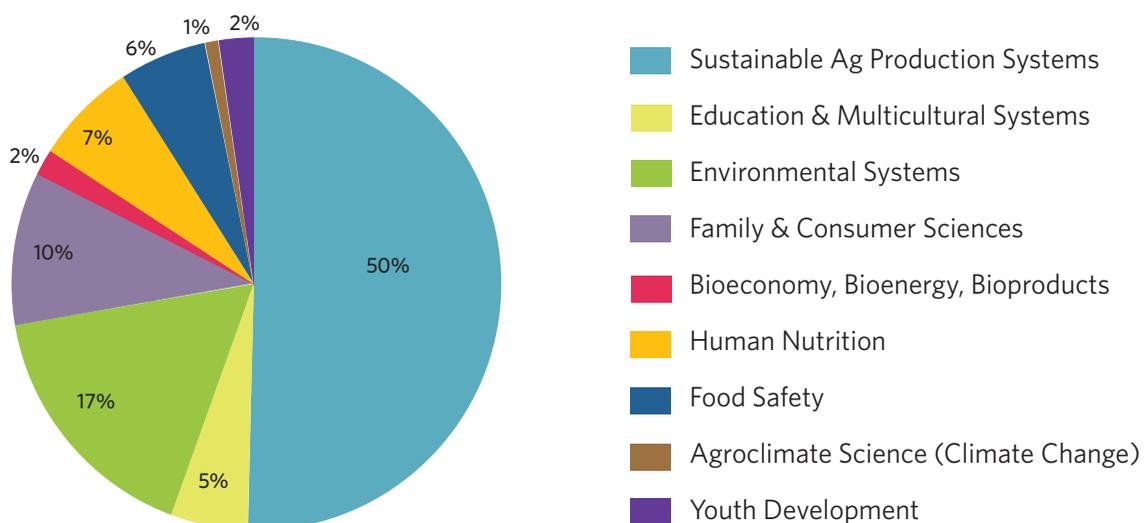
## SCIENCE EMPHASIS AREAS

## TOTAL COMPETITIVE PROJECT FUNDING BY PORTFOLIO\*

## COMPETITIVE PROJECTS ACTIVE IN 2017\*

Sustainable Ag Production Systems	\$324,050,047	776
Education & Multicultural Systems	32,755,125	155
Environmental Systems	108,250,521	343
Family & Consumer Sciences	64,548,290	257
Bioeconomy, Bioenergy, Bioproducts	11,171,731	27
Human Nutrition	44,626,009	139
Food Safety	37,361,706	139
Agroclimate Science	5,542,532	24
Youth Development	15,096,028	88
<b>Total</b>	<b>\$643,401,989</b>	

## COMPETITIVE FUNDING BY SCIENCE EMPHASIS AREA\*



\* estimated



# IMPACTS

**With NIFA funding, researchers across our nation make significant strides toward solving society's challenges in the areas of climate, bioenergy, education, the environment, family & consumer sciences, food safety, nutrition, sustainable agriculture, and youth development.**

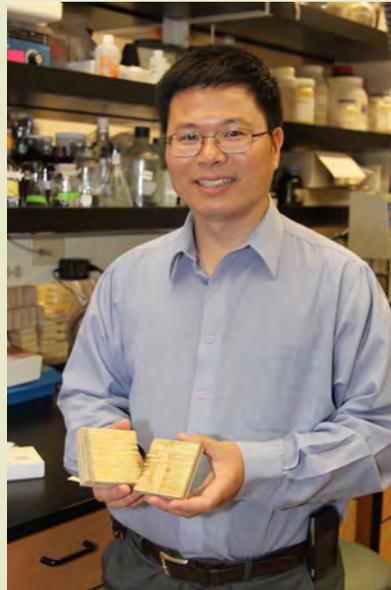
**The following pages contain a small fraction of the thousands of NIFA-supported research, education, and extension projects.**

## NIFA Grantee Earns Golden Goose Award

What do mussels, soy, kitchen cabinets, and golden geese have in common? Just ask **Oregon State University (OSU)** wood chemist Kaichang Li. Since his days as an organic chemistry graduate student, he was interested in reducing the need for hazardous solvents. One day, Li was out crabbing at the beach, and noticed how mussels clung tightly to rough, unwashed surfaces. In 2001, Li received a NIFA grant to develop a soy-based wood glue that could mimic the marine adhesive proteins found in the tenacious mussels.

Li filed a patent application for his mussel-inspired wood adhesive. A few years later, Columbia Forest Products (CFP) asked Li to develop a commercially viable soy-based glue to replace the formaldehyde-based adhesives the company used to produce plywood. For more than a decade, CFP had been formaldehyde-free and much of the industry has followed its lead.

In September, Li received a 2017 Golden Goose Award for creating a safer glue for plywood. The Golden Goose Award honors scientists whose federally funded work may have been considered odd or obscure when first conducted, but has resulted in significant benefits to society.



# Ensuring Sustainable, Adaptive Agroecosystems

NIFA-funded projects support the development of sustainable agriculture and forestry-based strategies that will be resilient to changing climate and result in improved ecosystem services, such as clean water, reduced erosion, and reduced greenhouse gases (GHG). These strategies include the selective breeding of crops and livestock, improved agronomic and animal husbandry approaches, and understanding the potential impacts on the landscape by changing management and land use practices.

- Identify new production practices that simultaneously increase the resiliency of agriculture and forestry systems with improved soil health and reduced GHG emissions;
- Reduce energy, nitrogen, carbon, and water footprints in agricultural production systems;
- Translate genomics research and resulting technologies to the agricultural and forestry production sector to adapt to climate variability;
- Develop and implement new nitrogen fertilizer recommendations that optimize yields while reducing GHG emissions; and
- Improve agricultural and forest sector inputs to climate change models.

## IMPACTS



### Nebraska Extension Tackles Extreme Weather

Nebraska has experienced five \$1 billion severe-storm events since 2010. **University of Nebraska** Extension educators are helping Nebraskans increase their knowledge and use of climate and weather information and resources through four focus areas: climate literacy, natural resource management, extreme weather resiliency, and scenario-based planning. The team hosted climate science presentations for more than 1,000 producers and crop consultants and held field-to-market workshops.

### Mitigating Past Agricultural Impacts, Improving Water Quality, and Sequestering Carbon

Salt water intrusion is on the rise in upland crops in the delta region of California that emit large amounts of carbon into the atmosphere. Researchers at **University of California, Davis** have examined the issue and provided information to farmers on the economic viability of transitioning to rice and the benefits from California's GHG emissions goals. One important finding is the amount of uptake of nitrous oxide (negative emissions) in these systems.

### Helping Animal Production Systems Pass the Sniff Test

The livestock industry needs a suite of robust technologies to reduce gaseous emissions to minimize their smell, the carbon/nitrogen footprint, and address variable climate concerns. **Iowa State University** researchers have shown that a bio-based, soybean-derived compound mitigates ammonia emissions up to 68 percent and major odors up to 90 percent without significant increase in nitrous oxide emissions.

### Managing Pests in the Golden Triangle

Non-native invasive shrubs, such as glossy buckthorn, reduce the regeneration and growth of economically important tree species. Researchers at the **University of New Hampshire** examined the effects of buckthorn on Eastern white pine seedlings, as well as possible control mechanisms in both managed

stands and natural areas. Their research found that two to three cuttings of buckthorn to ground level, at 28-day intervals, results in 100 percent eradication.

### Does Slick Hair Beat the Heat?

Dairy cattle with high heat tolerance (*Bos indicus*) generally produce less milk than cattle from temperate climates (*Bos taurus*). Researchers at **University of Puerto Rico at Mayaguez** studied a union of the two types, the Puerto Rican Holstein, which features a short, slick coat of hair. They determined that the breed does tolerate heat better than its normal-haired Holstein counterpart. Countries with hot climates could take advantage of this discovery to potentially increase their food production and help reduce hunger.

### Strengthening Virginia's Forests

**Virginia State University** (VSU) builds and strengthens forestry within the state. VSU Extension professionals support underserved populations, small and limited-resource landowners, and minority and economically disadvantaged communities. Educational outreach programs include small woodlot management practices, alternative forest production systems, and urban forest management practices.

### Online Tool Helps Producers Make Better Long-Term Decisions

**Purdue University, Indiana**, led a team of researchers, that included **University of Wisconsin** Extension, in an effort to create decision support tools and resources that will enhance farm resilience to a



variable and changing climate. The result is the U2U –Useful to Usable–project is a web-based one-stop shop for information that helps farmers manage increasingly variable weather and climate conditions across the Corn Belt.

### Creating a Glimpse into the Future

**University of Maryland** researchers used Earth System Modeling to simulate the impacts of decadal climate variability on water and agriculture in the Missouri River Basin. They input simulated data, crop yields, and various expenses, including crop insurance, into an economic impacts model. Projections indicated a value of \$30-\$80 million for that region alone.



# Strengthening Bio-Based Systems to Support Our Nation's Energy Independence

The Bioeconomy-Bioenergy-Bioproducts science emphasis area supports the expansion of regional production systems for biofuels and bio-based products. The development of non-petroleum-based fuels, power sources, and chemicals are just a few of the products resulting from these research, demonstration, extension, and education programs. These programs foster rural economic development, mitigate the impacts of a changing climate, reduce greenhouse gasses, improve wildlife and pollinator habitat, and improve water quality and food and energy security. NIFA collaborates with and leverages the resources of other federal agencies, such as U.S. Department of Energy's (DOE) Biomass Research Development Initiative (BRDI), and private sector investments to achieve the objectives of this Science Emphasis Area.

## IMPACTS



### Are Petite Poplars the Future of Biofuels? UW Studies Say Yes

The wood of poplar trees are a good source for biofuels, but the challenge is waiting 10-20 years between harvest cycles. Researchers at **University of Washington** have reduced harvest time to 2-3 years. Juvenile trees can be planted closer together and trimmed in a way that ensures most of the branches sprout up from the stump. Leaves, bark, and stems are then harvested and manufactured into bio oil and ethanol.

**From Pond Scum to Health Supplement and Fuel** Plant biologists and biochemists from **University of California, Berkeley** have produced a gold mine of data by sequencing the genome of a type of green algae. The tiny, single-celled organism can be a source of sustainable biofuel. The alga is also an abundant, natural source of the food supplement astaxanthin, an antioxidant with anti-inflammatory properties that may be useful for treating cancer, cardiovascular disease, neurodegenerative and inflammatory diseases, diabetes, and obesity.

## On-Farm Processing Leads to Economical Creation of Biofuels

A major hurdle in the production of biofuels is the sheer volume of biomass that must be harvested, transported, and stored to provide a continuous fuel supply. A **University of Kentucky**-led research team developed technology to increase the density of biomass bales in crops like switchgrass, corn stover, and wheat straw. Farmers may now sell the material as a value-added product for conversion to biofuels and biochemicals.

## Wheat Virus Infects Native Grass

New research from **Michigan State University** shows that farmers and scientists need to protect native plants from diseases emanating from their crops. Diseases from agricultural fields thought to affect only crops may also harm switchgrass, a primary biofuels crop. This basic research highlights the need for science to catch up in understanding how pests of crops influence native plants and bioenergy crops.

## Keeping Modified Genes Where They Belong

Federal regulators of biotechnology, some scientists, and citizens are concerned about potential gene flow from biotech crops crossing over into non-engineered plants. In a bioenergy crop such as switchgrass, **University of Tennessee** researchers have addressed that concern by engineering plants that do not flower and have sterile seeds and pollen. Project success will advance our technological toolkit and help allay fears of gene flow in engineered crops.



## Research Shows Beets Make Clean Biofuels

Energy beets are a developing non-food crop that can be an economical source of sugars for biofuel and chemical production. Research at **North Dakota State University** found that fermentable sugars stored as raw, thick juice have a carbon footprint that is about 30 percent and 50 percent lower than beet and corn grain, respectively. Beet ethanol could enable a GHG reduction of up to 57 percent, qualifying as an advanced biofuel.



# Educating Our Nation's Workforce

Work under the Education and Multicultural Alliances Science Emphasis Area supports education and workforce development programs that serve students from pre-kindergarten through the postdoctoral level and beyond. With the global population projected to increase beyond 9 billion in the coming years, one of the nation's greatest challenges is to educate new scientists and train skilled workers. NIFA's education programs support student recruitment and retention, teacher training, provide financial support, and advance the development of a diverse workforce in food, agriculture, natural resources, and human sciences areas.

NIFA-supported Agriculture in the Classroom (AIC) programs were implemented by state-operated programs to improve agricultural literacy, awareness, knowledge, and appreciation among pre-K through 12th-grade teachers and their students. In 2017, AIC's curriculum website had over 111,000 visitors who accessed 397 standards-based lesson plans and 722 companion resources. At the post-secondary level, AFRI educational programs supported approximately 1,100 undergraduates, 950 graduates, and 400 postdoctoral students. In addition, NIFA-funded projects indirectly supported about 75,000 students through recruitment/retention, curriculum development, and faculty development programs.

Over the past 14 years, NIFA has provided each state an average of \$910,000 per year in support of educational and workforce development programs. The states, on average, have leveraged those NIFA funds to \$7.7 million per year, for an average return-on-investment of \$8.46 per dollar.

## IMPACTS

### Sweet Potatoes Build International Bridges

Sweet potato is one of the most important food crops, and improving production will increase the economic stability of rural farmers around the world. Researchers at **University of Arkansas at Pine Bluff** and in **Guyana** built teaching and research capacities in both the Arkansas Delta and Guyana. This year, three visiting students researched methods to increase sweet potato production.

### Partnering for Bimaadiziwin—A Healthy Way of Life

**University of Minnesota** Extension and **Leech Lake Tribal College** are working together with the Band of Ojibwe to ensure food security to the reservation and support scientific, agricultural, and health literacy among youth. More than 700 residents participated in events that revived agricultural traditions, including planting and harvesting, food preservation, traditional skills, and saving the seeds of culturally important plants.



### **Increasing Curricula and Ag Student Enrollment**

There are two growing problems in agricultural education: decreasing enrollments and an increasing number of underrepresented students. Educators at **University of California, Santa Cruz** are enhancing and broadening the agriculture curriculum and partnering with community colleges and high schools. Underrepresented student enrollment has increased 31 percent, including 25-30 students per quarter in a “farm crew” internship program.

### **Nanomaterials Detection in Food, Water, and Environmental Waste**

Use of nanotechnology is increasing in virtually every segment of the food industry. **Delaware State University** acquired an Inductively Coupled Plasma-Mass Spectrometer, an instrument that can detect metals and several non-metals at micro levels of concentration in pharmacology, toxicology, and water quality and safety testing. To date, three graduate students in applied chemistry and food science and three undergraduate students have been trained and are currently proficient in running experiments independently.

### **Using Agriculture as a Fast Track Vehicle for Change through Experiential Learning**

The **Southern University and A&M College, Louisiana**, Agricultural Research and Extension Center provides agricultural training to incarcerated and adjudicated youth. Educators teach nutrition education, interpersonal social skills, and work skills through a horticulture experience. The multidisciplinary program allows participants to better prepare themselves for a healthy and productive lifestyle upon release.

### **Seeding the Future through Hydroponics**

**Boston College, Massachusetts**, researchers created an interdisciplinary hydroponic science curriculum to bring a farming experience to urban schools in low income areas. Students learn about science careers; the chemistry, physics, and physiology of plant growth; and economics of indoor hydroponic crop production. The project calls for 90 teachers to instruct 9,000 to 10,000 students through August 2018.

### **Education Investments Pay Off in Mississippi**

**Mississippi State University** Extension specialists created the Mississippi Master Cattle Producer Program to help producers improve overall management and decision-making skills. For every 100 participants, beef cattle production annual net returns increased by an estimated \$825,000. This equates

to an annual economic impact to date of greater than \$2.75 million.

### **Increasing Minority Veterinarians and Technicians**

According to the 2010 Census, African-Americans made up 12.3 percent of the U.S. population, but only 1.5 percent of veterinary professionals. **Florida A&M University (FAMU)** has recruited dozens of students who participated in pre-college summer programs, enrolled in FAMU’s collegiate veterinary science program, and completed internships with USDA and local veterinary clinics.



USDA Photo by Preston Keres

### **International Partnerships to Strengthen Agricultural Research, Education, and Cultural Experiences**

A limited number of students, especially from Historically Black Colleges and Universities are engaged in overseas experiential learning and intercultural activities. **Fort Valley State University, Georgia**, and **Alabama A&M University** have developed collaborative partnerships with **Universidad Nacional de Agricultura Honduras**, where students and faculty learned about sugarcane, coffee, tobacco, cashew, wine, shrimp, and tilapia production.

### **Growing Leaders in Texas**

**Texas A&M University - Kingsville**, with NIFA support, joined with **New Mexico State University** to create LEADERS - a collaborative program to improve science, technology, engineering, and mathematics representation among underserved animal sciences students. In just two years, the number of participating students reporting a GPA of higher than 3.0 increased from 73 to 97 percent.

# Safeguarding Our Environment

The goals of the Environmental Systems Science Emphasis Area are to proactively and comprehensively protect the critical air, water, and soil resources fundamental to life on Earth and the ecosystems that they foster on forest, range, grass and grazing, and recreational lands. Collaborative research conducted in this portfolio involves scientists, engineers, and extension professionals from a range of disciplines and organizations to solve the significant global challenges impacting these complex and interdependent systems. Projects bring together experts in land use, forests, rangeland, watershed management, wildlife habitat, agriculture land conservation, and small business innovation. These projects investigate ecosystems and the services they provide, such as:

- Supporting nutrient recycling, primary production, and soil formation necessary for the production of all other ecosystem services;
- Provisioning food, raw materials, water, genetic resources, energy, minerals, and medicinal resources;
- Experiences that humans obtain from ecosystems, including spiritual experiences, historical understanding, recreation, science, and education; and
- Carbon sequestration and climate regulation, waste decomposition, purification of water and air, and pest and disease control.

## IMPACTS

### Utah Pools Resources to Save Water

Utah was the second driest state in the nation in 2015, yet was among the top per capita users of water. **Utah State University** Extension agents created “Water Check,” a program that deploys extension interns to educate homeowners and groundskeepers in water conservation. Approximately 550 water checks are performed annually, which have saved more than 175 million gallons of water in Sandy and Salt Lake City alone.

### New Guide Provides Tools for Ranchers, Others in Sage-Grouse Country

If greater sage-grouse, which inhabits the sagebrush-steppe habitat in Wyoming, is listed under the Endangered Species Act, it could have significant impacts on ranching and livestock production in the state. **University of Wyoming** helped create the “Landowner Guide to Sage-grouse Conservation in Wyoming: A Practical Guide for Land Owners and Managers,” an easy-to-understand reference for sage-grouse conservation. The guide is available as a free download from the University of Wyoming Extension.

### Junking Junipers to Prevent Wildfire

**University of Nevada** Cooperative Extension’s Living with Fire program hosted events to help homeowners reduce the threat of wildfires, including “Junk the Junipers,” where residents bring flammable, woody vegetation from their yards to be turned into mulch or safely burned. Extension educators collected 50 tons of junipers and other flammable materials.

### ‘Smart Paper’ Can Conduct Electricity, Detect Water

A **University of Washington** scientist turned a lab accident into an inventive new sensor. The discovery occurred when a student spilled water onto paper laced with conductive nanomaterials. The water swelled the fibers in the paper, which broke the elec-



USDA photo



USDA photo

trical connection of the nanomaterials and turned off an indicator light. This smart paper may be wrapped around water pipes to detect leaks—a problem that costs public utilities about \$2.8 billion each year.

### Reclaiming Strip Mine Fields for Biofuel Crop Production

Researchers at **Pennsylvania State University** are returning life to damaged lands with a crop that can be a source of sustainable fuel and put to other agricultural purposes. By planting switchgrass into former strip mines, the researchers will reclaim soil health and create a crop that can be used to create ethanol, fuel pellets, livestock feed, animal bedding, mulch, and more.

### Super Sponge Cleans Lakes

**University of Minnesota** researchers used nanotechnology to create a sponge that absorbs mercury from water and kills bacterial and fungal microbes in a matter of seconds. The process is so effective that a sponge the size of a basketball can clean up Minnesota's Lake Como (68 acres at a depth up to 15 feet). Sponges convert the contamination into a non-toxic complex that may be disposed of in a landfill.

### St. Louis River Watch Watches Mercury

**Fond du Lac Tribal and Community College, Minnesota**, participates in the St. Louis River Watch Special Emphasis Project, keeping track of mercury levels in the watershed. Nearly 400 area middle and high school students have joined with undergraduates to gather data throughout the watershed and Lake Superior basin. Undergraduate students are also examining atmospheric loading of mercury and possible bioaccumulation in dragonflies.

### Protecting Soil and Water for Agriculture

**University of Nebraska** Extension scientists and

educators are helping residents manage agricultural systems to ensure clean water, optimize soil health, and improve sustainability. Thousands of Nebraskans attended the outreach efforts, which included a pesticide safety education program, manure and mulch workshops, and efficient nitrogen use and stewardship of the environment.

### Restoring a Tennessee Watershed

The Oostanula Creek watershed in eastern Tennessee was typical of waterways that run through both rural and urban areas: full of sediment, pathogens, chemicals, and other pollutants. **University of Tennessee** Extension specialists are restoring the creek from its status as an impaired stream by shoring up banks to cut down on erosion and by creating wetlands that cleanse the water through natural processes.

### Will Digital Agriculture Create a Healthier Environment?

**Michigan State University** researchers are investigating how big data can help farmers improve management strategies for water and nutrients and evaluate the economics of smart agriculture technologies and practices. Researchers are using drones equipped with cameras and sensors to evaluate crop growth to determine locations within fields that may require customized fertilizer application or irrigation. Results could lead to farm profits through increased production and reduced expenses for fertilizers.

### Keeping Tabs on Phosphorus in the Chesapeake

The Chesapeake Bay and its watershed suffer from varying degrees of water quality issues fueled by excess phosphorus runoff. **University of Delaware** researchers have discovered that particulate phosphorus was not an immediate environmental concern, however it cannot be ignored. Further research is needed to understand its potential hydrological and biogeochemical impacts.



USDA photo

# Strengthening Families, Farms, Communities, and the Economy

NIFA's Family & Consumer Sciences (FCS) Science Emphasis Area addresses 21st century human, economic, and health challenges. NIFA offers a range of research, education, and extension programs to help rural families and communities make healthy choices and better financial decisions to reach their full potential.

In 2017, NIFA committed \$2.8 million in competitive funding through the Rural Health and Safety Education (RHSE) Program. RHSE-funded educational outreach programs address the needs of rural Americans through cooperative extension. RHSE supports non-formal education programs and services to promote and enhance rural health, strengthen economic vitality, and, in the long run, mitigate the effects of rural poverty. Projects focus on chronic disease prevention and the prevention and reduction of opioid abuse.

Opioid abuse is a critical issue across the nation. The annual societal costs of opioid overdose, abuse, and dependence are estimated at \$78 billion, a figure that includes direct healthcare costs, lost productivity, and costs to the criminal justice system. The resulting impact on family well-being and community vitality are often less quantifiable—but nevertheless devastating—particularly in rural areas and farm communities.

## IMPACTS



### Healthy Grandparents, Healthy Families

The prevalence of grandfamilies is on the rise across the country, with 1 in 14 children being the product of grandfamilies. West Virginia ranks fourth in the nation for the percentage of grandparents raising one or more of their grandchildren. In its first year, **West Virginia State University's** Healthy Grandparents program graduated 43 grandparents who were raising 90 grandchildren. Participants learned several modern-day parenting skills, including social media, navigating the school system, and literacy. More than 97 percent of participants reported being better prepared to raise their grandchildren.

### Delivering the Goods in Fairbanks

With an average growing season of only 90 days, residents of **Fairbanks, Alaska**, don't always have ready access to locally grown fresh fruits and vegetables. The **Fairbanks Native Association Elders & Youth Community Garden Enterprise** distributes these hard-to-get foods to over 500 elders and low-income people in the area. More than a dozen volunteers contributed nearly 500 hours to the project last summer.

### Building Infrastructure to Fight Food Deserts

**DC Central Kitchen**, a community kitchen in the **District of Columbia**, develops and operates social ventures that target the cycle of hunger and poverty. Their programs prepare jobless adults for culinary

### Preventing Opioid Misuse in the Southeast: The Promise Initiative

Misuse and abuse of opioid-based prescription drugs disproportionately affects rural populations. **Mississippi State University** Extension's RHSE-funded Promise Initiative provides community engagement forums; extension agent-led and peer-to-peer education; a social marketing campaign; and placement of drug take-back boxes in rural communities. This coordinated education and communications campaign promotes behavior change at the consumer-level that can reduce the risk of opioid misuse and abuse.

careers, create living wage jobs for their graduates, and provide 3 million meals each year to homeless shelters, schools, and nonprofits across the District.

### **Kentucky Helps Communities with Agrosecurity Planning**

**University of Kentucky** (UK) leads the Extension Disaster Education Network “Strengthening Community Agrosecurity Planning” program, which helps build a community’s capacity to handle agricultural issues during emergencies. UK trained more than 1,100 people at 24 workshops in 20 states during the past three years.

### **Swine Health May Shed Light on Human Lung Disease**

**North Carolina A&T University** researchers found that long-term exposure to contaminants in animal production facilities contributes to respiratory diseases among agricultural workers, including chronic obstructive pulmonary disease (COPD). Their research into structural and cellular differences in swine respiratory systems contributed new findings to the science of respiratory health for swine and, potentially, for humans, which could lead to improved treatments for COPD.

### **Growing Inner City Opportunities**

The **Ohio State University**’s Urban GEMS (Gardening Entrepreneurs Motivating Sustainability) program enriches young people in high-risk communities by instilling health-related knowledge, attitudes, and behaviors amongst young people, while they gain skills in science, agriculture, and food production. In its first year, participants operated 26 tower gardens in nine locations within Columbus area food deserts. Their goal is to operate 90 gardens within five years.



### **A New Way to Fight Bed Bugs**

Bed bug infestations have grown exponentially and researchers at **Pennsylvania State University** answered the call. They showed that immobile fungus spores sprayed onto a surface can infect bed bugs. The exposed bed bugs carry the pathogen back to their nests to infect other bed bugs, and die within 3-4 days. This research led to the creation of Aprehend, a nontoxic biopesticide.

### **Planning for Successful Farm Transfers**

More than half of Indiana’s small farmers want to transfer their land and operations to their families, but have not yet made plans. **Purdue University, Indiana**, Extension is addressing this issue through workshops and information on the internet. Now, Indiana farmers are learning how to start succession planning, options for asset and management transfer, and the tools for risk management and financial feasibility.



# Improving the Food Quality and Safety of Our Food Supply

NIFA's Food Safety Science Emphasis Area supports our nation with a safe food supply. Approximately 48 million Americans contract foodborne illnesses each year from food contaminated with bacteria, viruses, parasites, or toxins. NIFA helps protect the food supply through research, education, and extension efforts that focus on all levels along the food chain, from production to consumption. NIFA funds a wide variety of food safety issues that include:

- Delivering food safety education, outreach, and training to a variety of audiences;
- Employing nanotechnology in production, processing, packaging, and safety of food;
- Increasing food safety and food quality through improved food manufacturing technologies and improved processing technologies;
- Improving safety across agricultural production systems, including organic agriculture
- Identifying the interactions between food safety, nutrition, and human health;
- Understanding plant-pathogen interactions;
- Implementing a systems approach for developing effective mitigation strategies for antimicrobial resistance;
- Preventing, detecting, and controlling foodborne and waterborne pathogens; and
- Understanding the ecology of foodborne pathogens, including viruses.

## IMPACTS



Edwin Remsberg photo - USDA

### Development of Sustainable Food Packaging Systems Derived from Renewable Biomass

**Tuskegee University, Alabama**, researchers are using biomass wastes to create food packaging systems with advanced antimicrobial properties. The researchers isolated cellulose from stevia and sugarcane and incorporated polymers to develop the active bio-plastic packaging film, proving the potential of cellulose-based composite films for high-end applications.

### Protecting Poultry without Antibiotics

*Salmonella* Enteritidis is the primary poultry-borne pathogen in the United States, and there is no fully effective poultry vaccination available. Researchers at the **University of Connecticut** are the first to use plant products to treat the infection where it starts, in chickens. They found that plant-derived antimicrobials can control the growth of *Salmonella* Enteritidis in broilers, on meat from chickens, on eggshells, and in laying hens.

## US-UK Collaborative Research: Host Resistance to Avian Pathogenic *E. Coli*

Scientists from **Iowa State University** and the Roslin Institute, **University of Edinburgh (United Kingdom)**, are collaborating to reduce the impact of Avian colibacillosis, a disease of poultry caused by *E. coli*. This project brings together U.S. and U.K. poultry immunology, genomics, and microbiology to develop veterinary and breeding strategies to produce healthier chickens.

## On Farm Food Safety for ProduceDirect Marketers

The Centers for Disease Control and Prevention (CDC) estimates that about 46 percent of all foodborne illness outbreaks originate with fresh produce. **Purdue University, Indiana**, adapted and delivered a targeted training program to fruit and vegetable producers and operators who sell directly to consumers and foodbanks. Participants have improved such food safety practices as manure application and management of wash water.

## Mapping a New Pathogen Contaminating Seafood

**University of New Hampshire** scientists have identified a strain of bacterial pathogen that has contaminated seafood and sickened shellfish consumers at increasing rates over the past decade. The researchers have developed a genetic “map” of the main pathogen, *Vibrio parahaemolyticus*, and two related strains as endemic to the Atlantic Coast of North America. They are now conducting additional research to understand how this pathogen evolved from harmless to pathogenic.



## Enhancing a Food Safety Culture in Farmers' Markets

If the growth trend continues, there will be 10,000 farmers' markets in the United States by 2020. Food science and technology researchers at **Virginia Tech** have created the Farmers' Market Food Safety toolkit, a hands-on food safety educational program for consumers and vendors to reduce the risk of foodborne illness.



USDA photo by Preston Keres

# Improving Health through Nutrition

NIFA supports research and education programs that lead to a healthy, nourished population. The Cooperative Extension System, with support from NIFA, delivers community-based nutrition education programs that help individuals, families, and communities make informed choices about food and lifestyles that support their physiological health and economic and social well-being. The programs also provide decisionmakers with the knowledge to make appropriate policies for citizens, with a focus on childhood obesity prevention and a better understanding of nutrients and how the body uses them.

The United States is making strides in combating food insecurity. The number of food insecure households, where the availability of nutritionally adequate and safe foods was limited or uncertain, dropped from 14 percent to 12 percent in the past few years, according to a study by USDA's Economic Research Service. NIFA supports many food and nutrition assistance programs that provide low income households access to food, a healthy diet, and nutrition education. Three such programs are:

- **Food Insecurity Nutrition Incentive (FINI)** is a joint program between NIFA and USDA's Food and Nutrition Service. FINI brings together stakeholders from different parts of the national food system to improve nutrition and health. In 2017, NIFA announced \$21 million in available funds for FINI projects, raising NIFA support to more than \$65 million since 2014.
- **Community Food Projects (CFP)** increase food security in communities by bringing the whole food system together to assess strengths, establish linkages, and create systems that improve the self-reliance of community members over their food needs. NIFA has provided more than \$100 million to support CFP projects since 1996, including \$8.6 million in 2017.
- **Expanded Food and Nutrition Education Program (EFNEP)**. In partnership with NIFA Family & Consumer Sciences, EFNEP provides opportunities for low-income youth and families to improve their nutritional health and well-being through evidence-based, hands on, interactive learning. Last year, NIFA provided \$67.9 million for EFNEP activities in all 50 states, six U.S. territories, and the District of Columbia. In all, 118,976 adults and 365,369 youth learned about diet quality, physical activity, food resource management, and food security. About 84 percent of EFNEP participants were at or below the poverty level, and 74 percent were in minority groups. Collectively, EFNEP program graduates reported food cost savings of \$1.3 million.

## IMPACTS

### Do You Like Maple Syrup? It Likes You!

Pure maple syrup contains 20 beneficial compounds that play a key role in human health. A researcher at the **University of Rhode Island** is investigating how bioactive compounds in maple syrup may help protect the body's immune system; have a positive impact on chronic inflammation, including metabolic syndrome, brain health, and liver disease; and promote a healthy gut. The project will also produce new information on clinical markers of inflammation and insulin sensitivity. The results of this study may show that indulging in maple syrup does not have to be a guilty pleasure.

### Preserve@Home Increases Food Preservation Knowledge and Behavior

A 2015 survey showed that 49 percent of millennials were interested in canning, and that 68 percent of Americans would rather make their own fresh foods than purchase store-bought food. To help prevent cases of foodborne illness, extension faculty from many institutions, including **University of Idaho**, provide Preserve@Home, an online home food safety and preservation class.

### Influence of Media Exposure on Diet and Body Mass Index among Young Adults

CDC estimates that more than one-third of U.S. adults are obese, a condition that results in chronic disorders such as type 2 diabetes, hypertension, cardiovascular disease, and certain cancers.



USDA Photo by Lance Cheung

**Lincoln University, Missouri** researchers are examining the role of the media and video games on waistline expansion in this country. Programs such as this may help reduce annual medical costs for obese people, which CDC estimates are \$1,429 higher than people of normal weight.

### Fort Peck Renovates Reservation Tribal Garden

**Fort Peck Community College, Montana**, Reservation Extension transformed its garden and turned it into an agri-tourism education pumpkin patch for the local kindergarten class. School children and other community members grew more than 700 pounds of potatoes, 200 pumpkins, and 400 pounds of other produce for the community's elder program and area food banks.

### Making an Island Home for Fresh Food

Having nutritious and culturally appropriate food is a major concern in the Pacific Basin. **Northern Marianas (Islands) College (NMC)** researchers conducted trials on 14 vegetable species to ensure their viability in local growing conditions. NMC's Aquaculture Development Center also established a fish breeding facility with a spawning program for egg production, fertilization, and hatching. NMC Extension educators are putting it all together with food and nutrition training through EFNEP.

### Studying a Mass Media Health Campaign's Reach and Effect on Obesity

The combined overweight and obesity prevalence in American Samoa stands at roughly 94 percent, making American Samoa the most overweight and obese country in the world. That obesity rate is directly associated with a high prevalence of type 2 diabetes, cardiovascular disease, and other chronic diseases. Health educators from **American Samoa Community College** partnered with TVZK, the local public television station, to broadcast the HBO series *The Weight of the Nation*, in the first widespread, continual health communications and social market-

ing campaign to combat the problem. All viewers who responded to a survey reported increasing fruit and vegetable consumption and physical activity.. About 47 percent of residents reported growing the highly nutritious, edible laupele in home vegetable gardens.

### Harnessing the Anti-Inflammatory Potency of Berries

A biochemical pathway in central nervous system neurons links synaptic dysfunction to neuroinflammatory changes in the brain, but studies show that diets rich in berry fruit help protect or improve cognitive health in aging individuals. **Cereon Biotechnology**, a company in **Fairbanks, Alaska**, identified the increased potency of Alaska wild berries to block the biochemical pathway beyond passive antioxidants, blunting damage to neuronal cells and potentially reducing the economic burden of age-related cognitive decline, estimated at about \$200 billion per year in the United States.



Edwin Remsburg photo - USDA

### Expanding Local Food Systems through Hands-On Education

Arkansas' Delta Region is a food desert, characterized by high poverty and low food production or distribution. Extension educators from **University of Arkansas at Pine Bluff** developed and provided hands-on education in growing vegetable varieties and establishing community gardens in seven counties. Students, public school faculty, and senior citizens learned to grow tomatoes, peppers, squash, cucumbers, okra, watermelons, cantaloupes, and herbs in raised bed and truck tire gardening.

### Beans and Rice: The Magical Meal

People who eat food enhanced with navy beans and rice bran may gain some protection against certain cancers. Researchers at **Colorado State University** have shown that eating a half-cup of beans and 30 grams of rice bran per day is enough to see changes in small molecules that can confer protection against colorectal cancer.

# Safeguarding the Global Food Supply Through Sustainable Agricultural Systems

The goal of Sustainable Agricultural Production Systems is to improve our nation's ability to abundantly and profitably produce food, fiber, and plant and animal products with good stewardship of the environment, public health, communities, and animal welfare. NIFA-funded programs enhance food security, safety, nutrition, and resilience of the food supply. Programs also advance agriculture through research, innovation, education, and the delivery of information, technology, and agricultural products.

## IMPACTS

### Flies and Fish in the Virgin Islands

Researchers at the **University of the Virgin Islands** are looking into a new food source for fish in aquaponics systems—black soldier flies. Studies show that the flies are a good source of protein and more economical than other food sources, reduce waste by 65 to 79 percent, and help prevent the spread of diseases like Salmonella and *E. coli*.

### It's all about the Water

Although aquaponically produced fish are consistently shown to be safe, current food safety audits assume that all animal wastes are potentially harmful, regardless of source. A **University of Hawaii** study of water quality showed that bacteria in aquaponics systems are beneficial and act as biological control agents against pathogenic bacteria.

### Illinois Planters Blast Away the Competition

Abrasive weeding uses air-propelled grit to destroy weed seedlings within crop rows. The process does not disturb the soil, and reduces yield loss and hand-weeding costs. **University of Illinois** researchers have created unique nozzles with 3-D printers and are using organic fertilizer as abrasive grits so farmers can manage weeds and soil fertility in one field pass.

### AgrAbility Program Helps Keep Ag Professionals on the Job

The Kansas AgrAbility Project (KAP) is a partnership between **Kansas State University**, Southeast Kansas Center for Independent Living, and **University of Kansas**. In the past year, KAP provided direct support to 82 farmers who were experiencing limitations from disability or illness with on-farm assistance, technical resources, or further referral to ensure continuity in their chosen profession of agriculture.



### Strawberry Fields Forever, Sort of

**University of New Hampshire** researchers have found a way to quadruple the length of the state's strawberry growing season, from four to 19 weeks. Using low tunnels (tunnel-like structures that provide growing conditions similar to greenhouses), producers may harvest strawberries from mid-July through Thanksgiving week. The technique will increase production by about 80 percent, adding to the state's \$1.85 million-per-year strawberry industry.

### Using the Disease Carrier to Fight Citrus Greening

Researchers at the **Boyce Thompson Institute** in Ithaca, **New York**, have discovered in the stomach of Asian citrus psyllids a protein that may be part of the insect's natural defense against the pathogen responsible for Huanglongbing (citrus greening). Results from this study will help inform future strategies to control citrus greening disease.

### Oh the Gall!

Researchers at **Oregon State University** have developed molecular tools to work with commercially available kits that will provide on-site detection

of crown gall disease. Gall is an incurable disease that modifies the plant's genome and causes large, cancer-like tumors (galls) to grow at its base. The new dipstick-like tool can detect the disease-causing pathogen within minutes of being plunged into the soil.

### Using Germplasm to Enhance Wheat

**South Dakota State University** researchers are using genetics to fight Fusarium head blight (FHB) in wheat. Their search uncovered gene variants in barley that respond to powdery mildew, a fungal disease that also affects wheat. They also discovered that additional research is needed to unravel the incredible complexity of a particular ribonucleic acid (a messenger that carries instructions from DNA) and the role it plays in the occurrence of FHB.

### Plants Provide New Antibiotic Treatment for Cattle

Mastitis, a potentially fatal mammary gland infection, is the most economically significant disease in dairy cows. Eschewing antibiotics, **University of Connecticut** researchers discovered that two plant-derived antimicrobials reduced an important mastitis pathogen, demonstrating that novel mastitis treatments may be viable.

### Developing the Tools and Germplasm for Hybrid Wheat

The **University of Nebraska-Lincoln** collaborated with the **International Maize and Wheat Improvement Center (Mexico)**, **Texas A&M University**, the **University of Hohenheim (Germany)**, **Kansas State University**, and **Genetics and Crop Plant Research – IPK (Germany)** to develop the necessary knowledge base and germplasm to support the development of hybrid wheat, which is more climate resilient than pureline wheat. The project, a part of the International Wheat Yield Partnership, is expected to help increase wheat yield to help U.S. farmers feed the needs of an increasing world population.

### Why Worry About Salinity and Shrimp?

Researchers at the **University of Guam** are examining the genetics of shrimp and their water salinity tolerance. They discovered significant familial differences in terms of growth, survival, and other biochemical factors. This research will lead to breeding lines of shrimp that are genetically attuned to water in specific aquaculture farms, which in turn will help producers increase yields and profits.

### Goats and Sheep vs. Barber Pole Worms

The barber pole worm is the world's greatest threat to profitable sheep and goat production, but the overuse of anti-parasitic remedies has led to drug resistance. Researchers at **Fort Valley State University, Georgia**, created the Targeted Selective Treatment (TST), which reduces the use of synthetic drugs by up to 90 percent. TST saves farmers \$150-\$200 per 100 animals per year and identifies parasite-resistant breeding stock.

### South Carolina's got it in the Bag

Grocers are not the only ones who bag produce—researchers at **Clemson University, South Carolina**, are putting paper bags over peaches to detract insects and diseases during production. They found that bagging golf ball-sized fruit can increase production by about 35 percent. Even with the added cost of labor to bag the fruit, increased yields raised profits by \$95 per tree.

### Silvopasture Increases Productivity and Profitability

Limited resource farmers and forest landowners face many economic challenges. Researchers at **Alabama A&M University** developed an integrated research, extension, and outreach program to promote sustainable loblolly-pine/meat goat silvopasture systems. Silvopasture combines forestry with animal grazing to enhance soil management and increase profitability. The study shows that silvopasture production generates sufficient return to labor and management (up to \$198 per acre or \$40.63 and \$34.32 per) to justify the farmers' investment.

### Decline in Wild Bees Will Sting Agriculture

The U.S. population of wild bees has declined 23 percent in recent years due, in part, to increases in agriculture and corresponding reductions in natural habitat. **University of Vermont** researchers created a national assessment to help focus both scientific and political efforts to understand and sustain wild bees. districts and 50 beginning farmers create sustainable agricultural systems.



# Strengthening Youth, Creating Sustainable Change

Programs in positive youth development science engage youth in constructive ways to develop strengths and promote civic engagement, healthy living, science education, and leadership skills. NIFA's positive youth development programs, in strategic partnership with Cooperative Extension, serve various audiences, including at-risk youth and military families. Programs are implemented through 4-H Clubs, afterschool programs, camps, and other educational experiences. As the federal partner, NIFA facilitates successful and sustainable community change directed by youth and supported by caring adults through local programming delivered by the Cooperative Extension System (CES). Positive Youth Development programs focus on:

- Increasing the capacity of CES to develop and implement positive youth programs;
- Evaluating program effectiveness and impacts; and
- Preparing the next generation with 21st century skills for a successful career and life.

## IMPACTS

### 4-H and NASA Team Up to Help Youth Develop Life Skills for Success

Astronaut and **Iowa 4-H** alumna Peggy Whitson was the inspiration for a new, collaborative project between NIFA and NASA. "Expeditionary Skills for Life" transformed several training topics used to prepare astronauts into activities that promote STEM education and develop important life skills for youth.

### Up, Up, and Away

**University of Hawaii** Extension's 4-H program includes a variety of activities to increase youth involvement in STEM-focused activities, such as rocketry. More than 500 volunteers contributed more than 40,000 hours to engage and support 3,200 youth in 60 4-H Clubs throughout the islands, as well as military clubs on each base throughout the state.



## 4-H Teen Urban Gardening Project

Food deserts are common in predominantly lower income neighborhoods, such as those in Bridgeport and Danbury, Connecticut. **University of Connecticut** conducted a 4-H urban teen gardening project to help provide fresh food to the community and develop life skills among at-risk youth. Youth volunteers grew and distributed 7,000 pounds of organic vegetables, a 43 percent increase over the previous year.

## 4-H Rocks for Missouri Youth of all Abilities

4-H is about more than barnyard animals. It's about emerging sciences, like rocketry and geographic information systems. 4-H is also about leadership, citizenship, and inclusion. In **Missouri**, 4-H Clubs take an inclusive approach with no set-aside, separate programs, or activities for youth with special needs. Examples of special needs youth in Missouri 4-H are featured in the YouTube video, "4-H and Youth with Special Needs."

## 4-H mappers showcase their work at international GIS conference

Some people are challenged by maps and geography, but a group of 4-H'ers are learning to create printed and online maps using geographic information systems (GIS). During the 2017 ESRI International GIS Conference, National 4-H GIS/GPS Leadership Team members Amanda Huggins, Elizabeth Sutphin, and Austin Ramsey (left to right in photo below), from **Eastern Tennessee**, showcased 4-H GIS programs and mapping projects to the 16,000 GIS professionals and educators from over 100 countries who attended the conference.



© Rebecca Emily Drobitz, National 4-H Council



Photo by Kevin Hudson, MSU Extension Service



ARS-USDA photo

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## LAND-GRANT COLLEGES AND UNIVERSITIES

### ALABAMA

Alabama A&M University, Normal  
 Auburn University, Auburn  
 Tuskegee University, Tuskegee

### ALASKA

Ilisagvik College, Barrow  
 University of Alaska, Fairbanks

### AMERICAN SAMOA

American Samoa Community College, Pago Pago

### ARIZONA

Diné College, Tsale  
 University of Arizona, Tucson  
 Tohono O'odham Community College, Sells

### ARKANSAS

University of Arkansas, Fayetteville  
 University of Arkansas at Pine Bluff, Pine Bluff

### CALIFORNIA

D-Q University, (Davis vicinity)  
 University of California System-Oakland as Headquarters, Oakland

### COLORADO

Colorado State University, Fort Collins

### CONNECTICUT

University of Connecticut, Storrs

### DELAWARE

Delaware State University, Dover  
 University of Delaware, Newark

### DISTRICT OF COLUMBIA

University of the District of Columbia, Washington

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Florida A&M University, Tallahassee  
 University of Florida, Gainesville

### GEORGIA

Fort Valley State University, Fort Valley  
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Kansas State University, Manhattan

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 Michigan State University, East Lansing  
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**MINNESOTA**

Fond du Lac Tribal & Community College, Cloquet  
 Leech Lake Tribal College, Cass Lake  
 University of Minnesota, St. Paul  
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**MISSISSIPPI**

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 Mississippi State University, Starkville

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 University of Missouri, Columbia

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 Chief Dull Knife College, Lame Deer  
 Aaniiih Nakoda College, Harlem  
 Fort Peck Community College, Poplar  
 Little Big Horn College, Crow Agency  
 Montana State University, Bozeman  
 Salish Kootenai College, Pablo  
 Stone Child College, Box Elder

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Little Priest Tribal College, Winnebago  
 Nebraska Indian Community College, Winnebago  
 University of Nebraska, Lincoln

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 Institute of American Indian and Alaska Native Culture and Arts Development, Sante Fe  
 New Mexico State University, Las Cruces  
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 Langston University, Langston  
 Oklahoma State University, Stillwater

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 Sinte Gleska University, Rosebud  
 Sisseton Wahpeton Community College, Sisseton  
 South Dakota State University, Brookings

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Tennessee State University, Nashville  
 University of Tennessee, Knoxville

**TEXAS**

Prairie View A&M University, Prairie View  
 Texas A&M University, College Station

**UTAH**

Utah State University, Logan

**VERMONT**

University of Vermont, Burlington

**VIRGIN ISLANDS**

University of the Virgin Islands, St. Croix

**VIRGINIA**

Virginia Tech, Blacksburg  
 Virginia State University, Petersburg

**WASHINGTON**

Northwest Indian College, Bellingham  
 Washington State University, Pullman

**WEST VIRGINIA**

West Virginia State University, Institute  
 West Virginia University, Morgantown

**WISCONSIN**

College of Menominee Nation, Keshena  
 Lac Courte Oreilles Ojibwa Community College, Hayward  
 University of Wisconsin, Madison

**WYOMING**

University of Wyoming, Laramie, WY

# CERTIFIED NON-LAND GRANT COLLEGES OF AGRICULTURE

## ALABAMA

University of  
West Alabama

## ARIZONA

Arizona State University

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Arkansas State University  
Arkansas Tech University  
Southern Arkansas  
University

## CALIFORNIA

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Polytechnic University,  
Pomona  
California State  
University, Bakersfield  
California State  
University,  
Channel Islands  
California State  
University, Chico  
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California State  
University, Northridge  
California State  
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California State  
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## FLORIDA

College of Central Florida  
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Georgia Institute of  
Technology

## ILLINOIS

Illinois State University  
Western Illinois  
University

## INDIANA

Ball State University  
Indiana State University  
Lehman College

## KANSAS

Fort Hays State University

## KENTUCKY

Eastern Kentucky  
University  
Murray State University  
Western Kentucky  
University

## LOUISIANA

The University  
of Louisiana at Monroe

## MAINE

The University  
of Southern Maine

## MARYLAND

University of  
Maryland, Baltimore  
County

## MICHIGAN

Wayne State University

## MINNESOTA

Minnesota State  
University, Mankato  
Southwest Minnesota  
State University

## MISSISSIPPI

The University of  
Southern Mississippi

## MISSOURI

Missouri State University  
Northwest Missouri  
State University  
Southeast Missouri  
State University  
University of Central Mis-  
souri

## NEW JERSEY

Montclair State University

## NEW YORK

City University  
of New York,  
Queens College  
State University  
of New York College  
of Agriculture and  
Technology at  
Cobleskill

## NORTH CAROLINA

Appalachian  
State University  
East Carolina University  
The University  
of North Carolina  
The University of North  
Carolina at Chapel Hill  
The University of North  
Carolina–Pembroke

## NORTH DAKOTA

Dickinson State  
University  
University of North  
Dakota–Grand Forks

## OHIO

Bowling Green State  
University  
Miami University,  
Oxford Ohio

## OKLAHOMA

The University  
of Central Oklahoma  
The University  
of Oklahoma

## OREGON

University of Oregon

## PENNSYLVANIA

Bloomsburg University  
of Pennsylvania

## SOUTH CAROLINA

The University  
of South Carolina

## TENNESSEE

Austin Peay  
State University  
Middle Tennessee  
State University  
Tennessee Technological  
University  
The University  
of Tennessee at Martin  
University of Tennessee at  
Chattanooga

## TEXAS

Angelo State University  
Sam Houston  
State University  
Sul Ross State University  
Tarleton State University  
Texas A&M University–  
Commerce  
Texas Southern  
University  
Texas Tech University  
The University  
of Texas at Austin  
University of North Texas  
West Texas  
A&M University

## UTAH

Southern Utah University

## VERMONT

Vermont Technical  
College–Randolph Center

## VIRGINIA

George Mason University  
Virginia Institute  
of Marine Science,  
Gloucester Point

## WISCONSIN

The University of  
Wisconsin–Platteville  
The University of  
Wisconsin–River Falls  
The University of  
Wisconsin–Stevens Point  
The University of  
Wisconsin–Stout

# HISPANIC-SERVING INSTITUTIONS (HSIs)

## ARIZONA

Arizona State University,  
Downtown Phoenix  
Arizona State University,  
West  
Arizona Western College  
Central Arizona College  
Cochise College  
College America, Phoenix  
Estrella Mountain  
Community College  
GateWay Community  
College  
Glendale Community  
College  
Phoenix College  
Pima Community  
College\*  
South Mountain  
Community College

## CALIFORNIA

Allan Hancock College  
Alliant International  
University  
Antelope Valley College  
Antioch University,  
Los Angeles  
Azusa Pacific Online  
University  
Bakersfield College  
Barstow Community  
College  
Bethesda University  
of California  
Brandman University  
Cabrillo College  
California Baptist  
University  
California Christian  
College  
California College  
San Diego, National City  
California College San  
Diego, San Marcos  
California College  
San Diego, San Diego  
California Lutheran  
University  
California State

Polytechnic University,  
Pomona  
California State  
University, Bakersfield  
California State  
University, Channel  
Islands  
California State  
University,  
Dominguez Hills  
California State  
University, East Bay  
California State  
University, Fresno  
California State  
University, Fullerton  
California State  
University, Long Beach  
California State  
University, Los Angeles  
California State  
University, Monterey Bay  
California State  
University, Northridge  
California State  
University, Sacramento  
California State  
University,  
San Bernardino  
California State  
University, San Marcos  
California State  
University, Stanislaus  
Canada College  
Casa Loma College,  
Van Nuys  
CBD College  
Cerritos College  
Cerro Coso  
Community College  
Chabot College  
Chaffey College  
Citrus College  
College of San Mateo  
College of the Canyons  
College of the Desert  
College of the Sequoias  
Community Christian  
College  
Contra Costa College

Crafton Hills College  
Cuesta College  
Cuyamaca College  
Cypress College  
East Los Angeles College  
El Camino College,  
Compton Center  
El Camino Community  
College District  
Evergreen Valley College  
Fresno City College  
Fresno Pacific University  
Fullerton College  
Gavilan College  
Glendale Community  
College  
Golden West College  
Grossmont College  
Hartnell College  
Holy Names University  
Humboldt State  
University  
Humphreys College,  
Stockton & Modesto  
Campuses  
Imperial Valley College  
La Sierra University  
Las Positas College  
Loma Linda University  
Long Beach City College  
Los Angeles City College  
Los Angeles County  
College of Nursing and  
Allied Health  
Los Angeles  
Harbor College  
Los Angeles  
Mission College  
Los Angeles  
Pierce College  
Los Angeles  
Southwest College  
Los Angeles  
Trade Technical College  
Los Angeles  
Valley College  
Los Medanos College  
Marymount California  
University  
Mendocino College

Merced College  
Merritt College  
MiraCosta College  
Modesto Junior College  
Monterey Peninsula  
College  
Moorpark College  
Moreno Valley College  
Mount St. Mary's College  
Mt. San Antonio College  
Mt. San Jacinto  
Community College  
District  
Napa Valley College  
National University  
Norco College  
Notre Dame  
de Namur University  
Orange Coast College  
Oxnard College  
Pacific Oaks College  
Pacific Union College  
Palo Alto University  
Palo Verde College  
Palomar College  
Pasadena City College  
Porterville College  
Reedley College  
Rio Hondo College  
Riverside City College  
Sacramento City College  
Saint Mary's College  
of California  
San Bernardino  
Valley College  
San Diego City College  
San Diego Mesa College  
San Diego  
State University  
San Diego State  
University, Imperial  
Valley Campus  
San Joaquin Delta  
College  
San Jose City College  
Santa Ana College  
Santa Barbara  
City College  
Santa Monica College  
Santa Rosa Junior College

Santiago Canyon College  
 Skyline College  
 Solano Community College  
 Southwestern College  
 Taft College  
 University of California, Merced  
 University of California, Riverside  
 University of California, Santa Cruz  
 University of La Verne  
 University of the West  
 Vanguard University of Southern California  
 Ventura College  
 Victor Valley College  
 West Hills College  
 Coalinga  
 West Hills College Lemoore  
 West Los Angeles College  
 Whittier College  
 Woodbury University  
 Woodland  
 Community College  
 Yuba College

**COLORADO**

Adams State College  
 Aims Community College  
 College America, Denver  
 College America, Fort Collins  
 College America, Colorado Springs  
 South Colorado Heights University  
 Colorado State University,  
 Pueblo  
 Community College of Denver  
 Otero Junior College  
 Pueblo Community College  
 Trinidad State Junior College

**CONNECTICUT**

Capital Community College  
 Housatonic Community College  
 Norwalk Community College

**FLORIDA**

Atlantic Institute of Oriental Medicine  
 Barry University  
 Broward College  
 Carlos Albizu University, Miami  
 City College, Altamonte Springs  
 City College, Hollywood  
 City College, Miami  
 Florida International University  
 Hillsborough Community College  
 Hodges University  
 Keiser University, Ft Lauderdale  
 Miami Dade College  
 Nova Southeastern University  
 Palm Beach State College  
 Polytechnic University of Puerto Rico, Miami  
 Polytechnic University of Puerto Rico, Orlando  
 Remington College, Tampa Campus  
 Saber College  
 Saint John Vianney College Seminary  
 South Florida State College  
 Saint Thomas University  
 Trinity International University, Florida  
 Valencia College

**ILLINOIS**

City Colleges of Chicago, Harold Washington College  
 City Colleges of Chicago, Harry S Truman College

City Colleges of Chicago, Richard J Daley College  
 City Colleges of Chicago, Wilbur Wright College  
 College of Lake County  
 Dominican University  
 Elgin Community College  
 Lexington College  
 Morton College  
 National Louis University  
 Northeastern Illinois University  
 Robert Morris University Illinois  
 Saint Augustine College  
 Triton College  
 Waubesa Community College  
**INDIANA**  
 Calumet College of Saint Joseph

**KANSAS**

Dodge City Community College  
 Donnelly College  
 Garden City Community College  
 Northwest Kansas Technical College  
 Seward County Community College and Area Technical School  
**LOUISIANA**  
 Saint Joseph Seminary College

**MASSACHUSETTS**

Northern Essex Community College  
 Springfield Technical Community College  
 Urban College of Boston

**NEVADA**

College of Southern Nevada

**NEW JERSEY**

Cumberland County College  
 Essex County College

Fairleigh Dickinson University, Metropolitan Campus  
 Hudson County Community College  
 Middlesex County College

**NEW JERSEY**

City University  
 Passaic County Community College  
 Pillar College  
 Saint Peter's College  
 Union County College

**NEW MEXICO**

Central New Mexico Community College  
 Clovis Community College  
 Eastern New Mexico University, Main Campus  
 Eastern New Mexico University, Roswell Campus  
 Eastern New Mexico University, Ruidoso Campus  
 Luna Community College  
 Mesalands Community College  
 New Mexico Highlands University  
 New Mexico Institute of Mining and Technology  
 New Mexico Junior College  
 New Mexico State University, Alamogordo  
 New Mexico State University, Carlsbad  
 New Mexico State University, Dona Ana  
 New Mexico State University, Grants  
 New Mexico State University, Main Campus  
 Northern New Mexico College  
 Santa Fe Community College

University  
of New Mexico,  
Los Alamos Campus  
University  
of New Mexico,  
Main Campus  
University  
of New Mexico,  
Taos Campus  
University of New  
Mexico, Valencia  
County Campus  
University of the  
Southwest  
Western New Mexico  
University

## **NEW YORK**

Boricua College  
College of Mount  
Saint Vincent  
CUNY Borough  
of Manhattan  
Community College  
CUNY Bronx  
Community College  
CUNY City College  
CUNY Hostos  
Community College  
CUNY John Jay College  
of Criminal Justice  
CUNY LaGuardia  
Community College  
CUNY Lehman College  
CUNY New York City  
College of Technology  
CUNY Queens College  
CUNY Queensborough  
Community College  
Dominican College  
of Blauvelt  
Mercy College  
Nyack College  
Professional Business  
College  
Stella and Charles  
Guttman Community  
College  
SUNY Westchester  
Community College  
Vaughn College  
of Aeronautics and

Technology

## **OHIO**

Union Institute  
& University

## **OREGON**

Mount Angel Seminary

## **PENNSYLVANIA**

Reading Area  
Community College

## **PUERTO RICO**

American University  
of Puerto Rico, Bayamon  
American University  
of Puerto Rico, Manati  
Atenas College  
Atlantic University  
College  
Bayamon Central  
University  
Caribbean University,  
Bayamon  
Caribbean University,  
Carolina  
Caribbean University,  
Ponce  
Caribbean University,  
Vega Baja  
Carlos Albizu University,  
San Juan  
Centro de Estudios  
Multidisciplinarios,  
Bayamon  
Centro de Estudios  
Multidisciplinarios,  
Humacao  
Centro de Estudios  
Multidisciplinarios,  
San Juan  
Colegio Universitario  
de San Juan  
Dewey University,  
Hato Rey  
EDP University of Puerto  
Rico Inc, San Juan  
EDP University of Puerto  
Rico Inc, San Sebastian  
Escuela de Artes Plas-  
ticas

de Puerto Rico  
Humacao Community  
College  
Instituto Tecnologico  
de Puerto Rico,  
Recinto de Guayama  
Instituto Tecnologico  
de Puerto Rico,  
Recinto de Manati  
Instituto Tecnologico  
de Puerto Rico,  
Recinto de Ponce  
Instituto Tecnologico  
de Puerto Rico,  
Recinto de San Juan  
Inter American University  
of Puerto Rico, Aguadilla

Inter American University  
of Puerto Rico, Arecibo  
Inter American University  
of Puerto Rico,  
Barranquitas  
Inter American University  
of Puerto Rico, Bayamon  
Inter American University  
of Puerto Rico, Fajardo  
Inter American University  
of Puerto Rico, Guayama  
Inter American University  
of Puerto Rico, Metro  
Inter American University  
of Puerto Rico, Ponce  
Inter American University  
of Puerto Rico,  
San German  
Pontifical Catholic  
University  
of Puerto Rico, Arecibo  
Pontifical Catholic  
University of Puerto Rico,  
Mayaguez  
Pontifical Catholic  
University of Puerto Rico,  
Ponce  
Puerto Rico  
Conservatory of Music  
San Juan Bautista  
School of Medicine  
Universal Technology  
College of Puerto Rico  
Universidad Adventista

de las Antillas  
Universidad Central  
del Caribe  
Universidad Del Este  
Corazon  
Universidad Del Turabo  
Universidad  
Metropolitana  
Universidad  
Pentecostal Mizpa  
Universidad Politecnica  
de Puerto Rico  
Universidad Teologica  
del Caribe  
University of Puerto Rico,  
Aguadilla  
University of Puerto Rico,  
Arecibo  
University of Puerto Rico,  
Bayamon  
University of Puerto Rico,  
Carolina  
University of Puerto Rico,  
Cayey  
University of Puerto Rico,  
Humacao  
University of Puerto Rico,  
Mayaguez  
University of Puerto Rico,  
Medical Sciences  
University of Puerto Rico,  
Ponce  
University of Puerto Rico,  
Rio Piedras  
University of Puerto Rico,  
Utua

## **TENNESSEE**

Mid-South Christian  
College

## **TEXAS**

Alvin Community College  
Amarillo College  
Angelo State University  
Austin Community  
College District  
Baptist University  
of the Americas  
Brazosport College  
Brookhaven College  
Coastal Bend College

College of Biblical Studies, Houston  
 College of the Mainland  
 Del Mar College  
 Eastfield College  
 El Centro College  
 El Paso Community College  
 Galveston College  
 Hallmark College  
 Houston Baptist University  
 Houston Community College  
 Howard College  
 Jacksonville College, Main Campus  
 Laredo Community College  
 Lee College  
 Lone Star College System  
 McLennan Community College  
 Midland College  
 Mountain View College  
 North Lake College  
 Northwest Vista College  
 Northwood University, Texas  
 Odessa College  
 Our Lady of the Lake University, San Antonio

Palo Alto College  
 Remington College, Dallas Campus  
 Remington College, Fort Worth Campus  
 Remington College, Houston Campus  
 Remington College, Houston Southeast Campus  
 Remington College, North Houston Campus  
 Richland College  
 Saint Edward's University  
 San Antonio College  
 San Jacinto Community College  
 Schreiner University  
 South Plains College  
 South Texas College  
 Southwest Collegiate Institute for the Deaf  
 Southwest Texas Junior College  
 Southwestern Adventist University  
 St. Mary's University  
 St. Philip's College  
 Sul Ross State University  
 Tarrant County College District

Texas A&M International University, Laredo  
 Texas A&M University, Corpus Christi  
 Texas A&M University, Kingsville  
 Texas Lutheran University  
 Texas State Technical College, Harlingen  
 Texas State Technical College, West Texas  
 Texas State University  
 The University of Texas at Arlington  
 The University of Texas at Brownsville  
 The University of Texas at El Paso  
 The University of Texas at San Antonio  
 The University of Texas Health Science Center at San Antonio  
 The University of Texas of the Permian Basin  
 The University of Texas, Pan American  
 University of Houston  
 University of Houston, Clear Lake  
 University of Houston,

Downtown University of Houston, Victoria  
 University of St. Thomas  
 University of the Incarnate Word  
 Victoria College  
 Wayland Baptist College  
 Western Texas College  
 Wharton County Junior College  
 virginia  
 Bethel College

## WASHINGTON

Big Bend Community College  
 Columbia Basin College  
 Heritage University  
 Wenatchee Valley College  
 Yakima Valley Community College

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## NIFA'S PARTNERS

### STATE & FEDERAL:

U.S. Department of Commerce  
 U.S. Department of Defense  
 U.S. Department of Energy  
 U.S. Department of Health and Human Services  
 U.S. Department of Housing and Urban Development  
 U.S. Department of the Interior  
 U.S. Environmental Protection Agency  
 Tennessee Valley Authority

National Science Foundation  
 National Institutes of Health

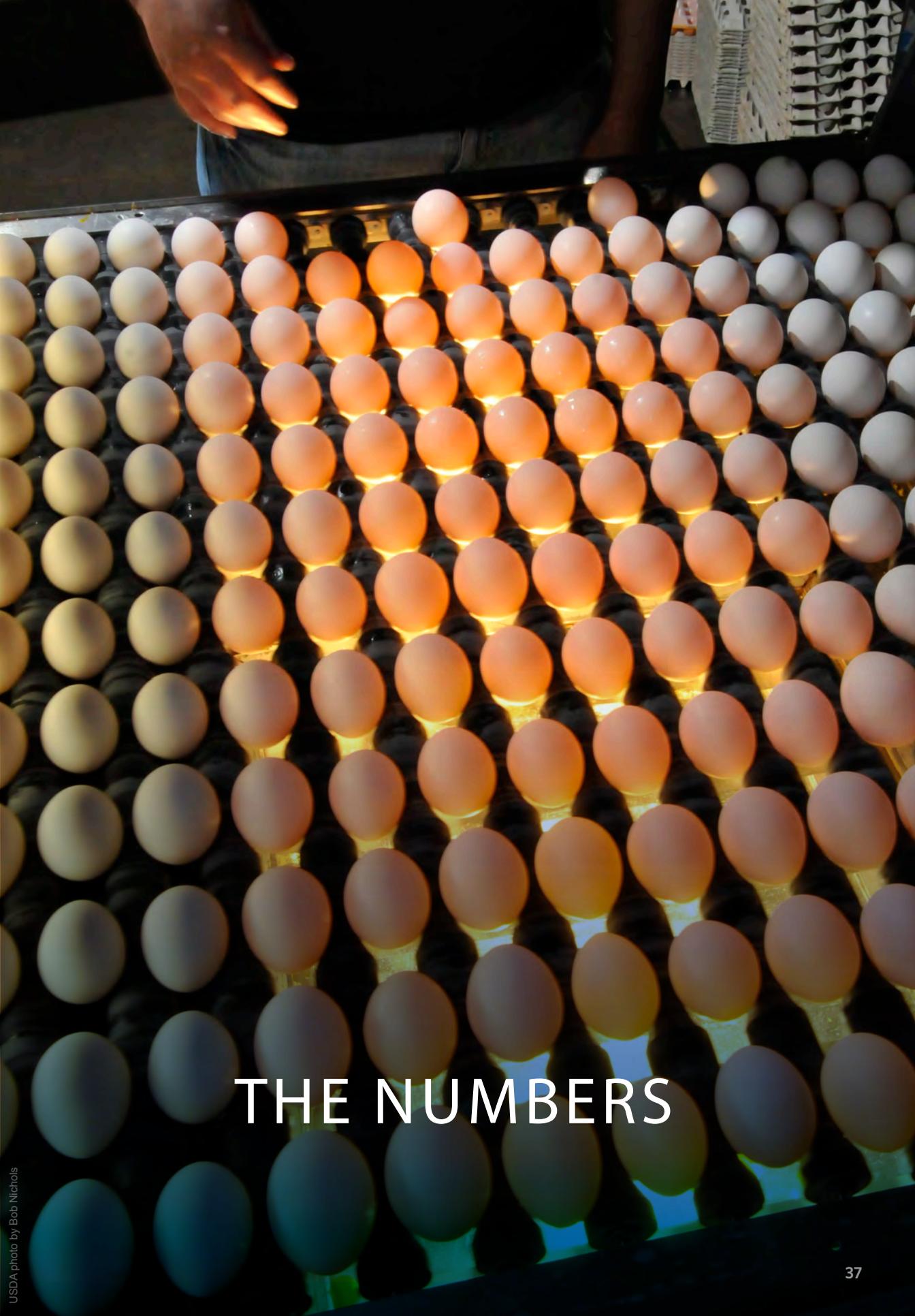
### USDA AGENCIES:

Agricultural Marketing Service  
 Agricultural Research Service  
 Animal and Plant Health Inspection Service  
 Center for Nutrition, Policy and Promotion  
 Economic Research Service  
 Farm Service Agency  
 Food and Nutrition Service

Food Safety and Inspection Service  
 Foreign Agricultural Service  
 Forest Service  
 Grain Inspectors, Packers, and Stockyards Administration  
 National Agricultural Library  
 National Agricultural Statistical Service  
 Natural Resources Conservation Service  
 Risk Management Agency  
 Rural Development

### OTHER:

Association of Public and Land-grant Universities  
 Foundation for Food and Agriculture Research  
 National Agricultural Research, Extension, Education, and Economics Advisory Board



# THE NUMBERS

## NATIONAL INSTITUTE OF FOOD AND AGRICULTURE (\$000)

### PROGRAMS

### FY 2017 CONSOLIDATED APPROPRIATIONS

#### DISCRETIONARY FUNDING

##### RESEARCH AND EDUCATION ACTIVITIES

Agriculture and Food Research Initiative	\$375,000
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##### CAPACITY PROGRAMS:

Hatch Act	243,701
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McIntire-Stennis Cooperative Forestry	33,961
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Evans-Allen Program	54,185
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Animal Health and Disease, Section 1433	4,000
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##### SPECIAL RESEARCH GRANTS:

Minor Crop Pest Management, IR-4	11,913
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Global Change, UV-B Monitoring	1,405
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Potato Research	2,250
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Aquaculture Research	1,350
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##### OTHER RESEARCH:

Aquaculture Centers	4,000
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Sustainable Agriculture Research and Education Program	27,000
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Supplemental and Alternative Crops	825
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1994 Research Grants	1,801
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Federal Administration (Direct Appropriation)	20,339
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Farm Business Management and Benchmarking Program	1,450
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Sun Grant Program	3,000
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Capacity Building for Non-Land Grant Colleges of Agriculture	5,000
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Alfalfa and Forage Research	2,250
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##### HIGHER EDUCATION:

Institution Challenge, Multicultural Scholars and Graduate Fellowship Grants	9,000
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1890 Institution Capacity Building Grants	19,336
---	--------

Hispanic-Serving Institutions Education Grants Program	9,219
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Tribal Colleges Education Equity Grants Program	3,439
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Interest Earned on Tribal Colleges Endowment Fund	4,823
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Secondary Education/2-Year Post Secondary	900
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Alaska Native-Serving and Native Hawaiian-Serving Institutions	3,194
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Veterinary Medical Services Act (Loan Repayment Program)	6,500
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Veterinary Services Grant Program	2,500
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Grants for Insular Areas	2,000
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<b>SUBTOTAL a/</b>	<b>854,341</b>
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##### EXTENSION ACTIVITIES

##### CAPACITY PROGRAMS:

Smith-Lever Formula 3(b)&(c)	300,000
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1890 Institutions	45,620
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##### SMITH-LEVER 3(d) PROGRAMS:

Expanded Food and Nutrition Education Program	67,934
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Farm Safety and Youth Farm Safety Education and Certification	4,610
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New Technologies for Agricultural Extension	1,550
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## NATIONAL INSTITUTE OF FOOD AND AGRICULTURE (\$000)

### PROGRAMS

### FY 2017 CONSOLIDATED APPROPRIATIONS

Children, Youth, and Families at Risk	\$8,395
Federally-Recognized Tribes Extension Program	3,039
<b>OTHER EXTENSION PROGRAMS:</b>	
Extension Services at 1994 Institutions	4,446
Renewable Resources Extension Act	4,060
Rural Health and Safety	3,000
1890 Facilities (Section 1447)	19,730
Food Animal Residue Avoidance Database Program	1,250
Women and Minorities in Science, Technology, Engineering and Mathematics	400
Food Safety Outreach Program	5,000
Federal Administration b/	8,357
<b>SUBTOTAL</b>	<b>477,391</b>
<b>INTEGRATED ACTIVITIES</b>	
<b>SECTION 406 LEGISLATIVE AUTHORITY:</b>	
Methyl Bromide Transition Program	2,000
Organic Transition Program	4,000
Crop Protection/Pest Management	20,000
<b>OTHER LEGISLATIVE AUTHORITIES:</b>	
Regional Rural Development Centers	2,000
Food and Agriculture Defense Initiative	8,000
<b>SUBTOTAL</b>	<b>36,000</b>
General Provision: Enhancing Agricultural Opportunities for Military Veterans c/	5,000
<b>TOTAL, DISCRETIONARY FUNDING a/</b>	<b>1,372,732</b>
<b>FARM BILL MANDATORY AND ENDOWMENT FUNDING</b>	
Tribal Colleges Endowment Fund	11,880
Organic Agriculture Research and Extension Initiative	18,620
Beginning Farmer and Rancher Development Program	18,620
Biomass Research and Development Initiative d/	2,793
Specialty Crop Research Initiative	51,205
Emergency Citrus Research and Extension Program	23,275
Food Insecurity Nutrition Incentive Program	18,620
Biodiesel Fuel Education Program e/	931
Agriculture Risk Management Education Program e/	4,655
Community Food Projects Competitive Grants Program e/	9,000
<b>TOTAL, FARM BILL MANDATORY AND ENDOWMENT FUNDING</b>	<b>159,599</b>
<b>TOTAL, DISCRETIONARY, FARM BILL MANDATORY, AND ENDOWMENT FUNDING a/ f/</b>	<b>1,532,331</b>

**NOTES:**

a/ Interest earned on Tribal College Endowment Fund is included in the total.

b/ In FY 2017 Consolidated Appropriation \$552,000 is provided within the total for Agriculture in the Classroom.

c/ In FY 2017 CA under Section 760.

d/ Farm Bill funding for this program expires in FY 2017.

e/ Mandatory program delegated to another USDA agency but administered by NIFA.

f/ Farm Bill funding amounts are based on H.R. 2642, the Agricultural Act of 2014 and include impact of sequestration of mandatory funds in FY 2017.

## STATES AWARD STATISTICS FOR FISCAL YEAR 2017 NON -FORMULA AWARDS\*

PERFORMING ORGANIZATION	NUMBER OF AWARDS	TOTAL FUNDING
1862 Land-Grant University (LGU)	945	\$464,158,967
1890 LGU (including Tuskegee University)	68	27,926,750
1994 LGU	96	10,372,575
Certified Non-LGU	42	13,027,801
Non Land-Grant Public University or College	36	14,021,407
Other	43	17,682,588
Private, For-Profit	123	25,722,079
Private, Non-Profit	120	43,409,064
Private University or College	65	39,435,308
State, Local, or Tribal Government	15	6,902,664
USDA Agency	20	9,533,675
<b>Total</b>	<b>1,573</b>	<b>\$672,192,878</b>

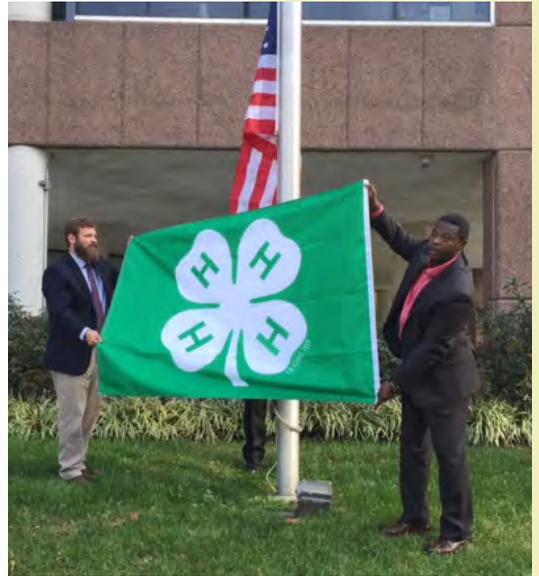
## STATES AWARD STATISTICS FOR FISCAL YEAR 2017 FORMULA AWARDS\*

PERFORMING ORGANIZATION	NUMBER OF AWARDS	TOTAL FUNDING
1862 LGU	395	\$566,794,308
1890 LGU (including Tuskegee University)	91	99,306,942
Other Non Land-Grant Institutions	36	54,239,757
<b>Totals</b>	<b>522</b>	<b>\$720,341,007</b>

# SPECIAL RECOGNITION

## Happy Anniversary, 4-H

Chance Wiley and Robert Martin unfurl and prepare to hoist a new 4-H flag at the National Institute of Food and Agriculture, home of **4-H National Headquarters**. The new flag marks the 115th anniversary of 4-H and recognizes the 103rd year of 4-H being the positive youth development program of the federal government.



USDA Photo by Dorrisel Resto

## Georgia 4-H'er Becomes Teen Farmer

Janya Green is exceptional. She's not just a 4-H'er and student at Worth County Middle School in Georgia, she is also a farm manager at the age of 13. Janya spent many summers on her grandfather's farm learning how plants grow. Her efforts caught the attention of **Fort Valley State University's** 4-H Club coordinator, who appointed Janya farm manager of the Village Community Garden. Her responsibilities include 10 aeroponics towers, helping coordinate food give-a-ways, and teaching agriculture to children.



USDA photo

## Unmasking Salmonella

**University of Georgia** food microbiologist Xiangyu Deng received the 2017 Creative Research Medal for creating cloud-based software that quickly classifies strains of *Salmonella*. The SeqSero system can quickly and accurately label any of the more than 2,500 serotypes of *Salmonella*, replacing the existing complicated, time-consuming laboratory protocol. The software is being used by the CDC, the U.S. Food and Drug Administration, several state health departments, and more than 20 international regulatory agencies.

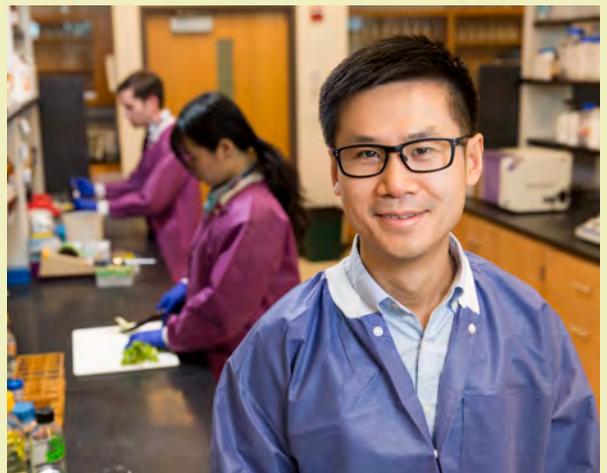


Photo by Andrew Davis Tucker, University of Georgia

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Dr. Otto Gonzalez

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Paula Geiger

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Vacant

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Bobbie Moore

## DIRECTOR, PLANNING, ACCOUNTABILITY, AND REPORTING STAFF

Barton Hewitt

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## IN MEMORIAM



It is with great sadness that we report of Dr. Catalino "Lino" Blanche's passing, Jan. 29, 2018. Lino was the national program leader for forest resources at NIFA's Institute of Bioenergy, Climate, and Environment where he managed NIFA's McIntire-Stennis Cooperative Forestry Research Program and other forestry-related programs for the past 15 years. Dr. Blanche earned BS and MS degrees from the University of the Philippines in Los Banos, an MS from the University of Georgia, and a Ph.D. in forestry from Mississippi State University. Dr. Blanche was an associate program director at Southern University in Louisiana; a research scientist for USDA's Agricultural Research Service in Arkansas; and a research scientist at Mississippi State University. He was a member of the Secretary of Agriculture's Forestry Research Advisory Council and past-president of the Philippine-American Academy of Science and Engineering. His research interests included Southern pine-bark beetle interactions, bioenergy, urban forestry, and agroforestry.



It is with regret that we announce the passing of Dr. Parshotam S. Benepal on Dec. 1, 2017. Dr. Benepal worked as a liaison for the 1890 LGUs to resolve challenges and support their programs. Those institutions are better as a result of his dedication and commitment. Before joining NIFA, he was a faculty member at Virginia State University from 1967 until 1972. Next, he became chair of Department of Life Sciences from 1972 to 1977, and later served as a director of Agricultural Research Station from 1980 to 1990. In 2003, Dr. Benepal joined NIFA, where he served as a liaison for 1890 LGUs until his retirement in 2015.

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