ARS
OFFICE OF INTERNATIONAL RESEARCH ENGAGEMENT AND COOPERATION

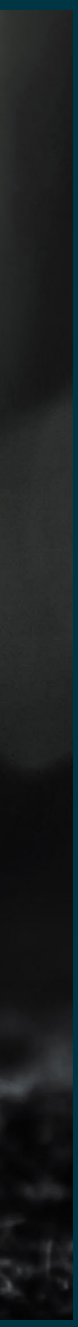
Annual Report for Fiscal Year 2019

USDA United States Department of Agriculture

ARS
Office of International Research Engagement and Cooperation

Annual Report, May 2020

Contents



I hope you find this report informative and that it sheds light on the many ways OIREC can help facilitate ARS international engagement. We look forward to partnering with you!

From the Director

We are pleased to present the ARS Office of International Research Engagement and Cooperation (OIREC) Annual Report for Fiscal Year (FY) 2019. The report provides a snapshot of the great work the OIREC team conducted in partnership with ARS researchers and program and administrative offices to help advance the ARS mission.

OIREC did not release an Annual Report for FY 2018. Instead, we took a strategic pause in 2019, when the FY 2018 report would have been drafted, to actively engage with ARS leadership, researchers, and support staff to explore how OIREC could enhance our impact and better serve the Agency. Our engagement efforts resulted in the *ARS OIREC Multi-Year Strategy for Enhancing ARS Agricultural Research: FY 2020-2025*. With the Multi-Year Strategy—informed by the ARS community—as our guide, we reviewed and began modernizing some of our internal systems, processes, and procedures to better enable OIREC to achieve the strategic goals and objectives outlined in the strategy.

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Bryan Norrington
Director, Office of International Research Engagement and Cooperation

Introduction

In fiscal year (FY) 2019, international collaboration continued to be an integral component of the ARS research mission. While ARS is charged with finding solutions to the problems of agricultural producers and consumers in the United States, partnerships with international collaborators help ARS scientists meet their scientific objectives. These collaborations bring fresh perspectives and novel resources to ARS' research projects and help ARS researchers test their ideas and technologies across a wide variety of climates, conditions, and cultural contexts.

The Agriculture Improvement Act of 2018, signed into law on December 20, 2018, underscored the significance of global research partnerships by adding new text that supports "international collaboration that leverages resources and advances priority food and agricultural interests of the United States," including addressing emerging plant and animal diseases, improving crop varieties and animal breeds, and developing safe, efficient, and nutritious food systems. As Federal funding continues to decrease as a share of overall investment in agricultural research and development in the United States, it has become even more important to join forces and share resources with like-minded scientists and research organizations in partner countries.

In 2019, ARS researchers reported 1,534 international collaborative activities across all program areas and research locations. These activities demonstrate the broad array of scientific expertise at ARS, from improving food crops so they can grow better in heat and drought conditions, to developing more efficient systems for irrigating agricultural land, to finding new biological control agents for invasive insects and weeds. The ARS Office of International Research Engagement and Cooperation (OIREC) supports these research partnerships by creating and facilitating international scientific networks, managing programs with international scientific collaborators, representing ARS in internationally focused working groups and committees, and providing support as needed when scientists implement their research projects.

OIREC Programs and Projects

Multi Year Strategy

OIREC has developed the *ARS Office of International Research Engagement and Cooperation Multi-Year Strategy (MYS) for Enhancing ARS Agricultural Research: Fiscal Year 2020 – Fiscal Year 2025*. This document establishes goals and objectives for OIREC's efforts to enhance the ARS and USDA research mission through global engagement. The strategy builds on priorities and goals that are outlined in the USDA Strategic Plan for FY2018-2022, the USDA Science Blueprint for 2020-2025, and the ARS Strategic Plan for 2018-2020. The multiyear strategy is available on OIREC's Axon page.

ARS-USAID Participating Agency Service Agreement (PASA)

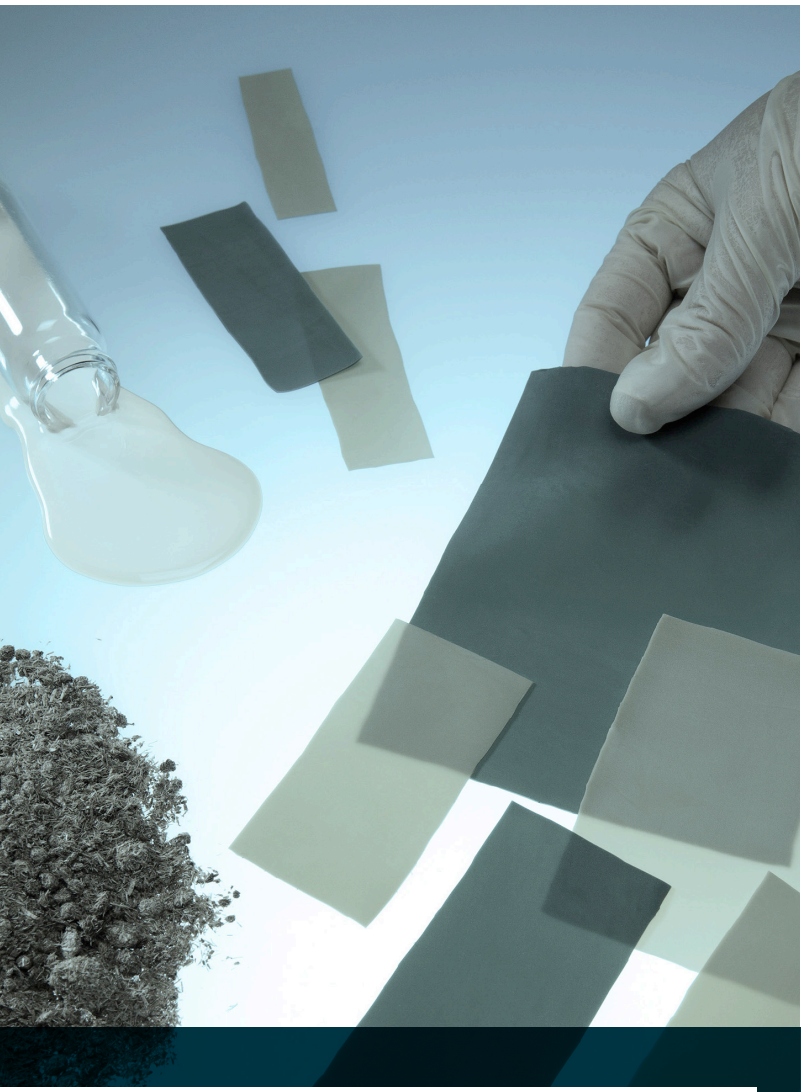
The PASA agreement allows USAID to procure the services of a small group of ARS employees who serve as technical experts for USAID science programs and provides ARS with cooperative research funding (CRF) to support projects of joint domestic and international significance led by ARS researchers. In FY 2019, USAID provided just over $4.35 million through the PASA, including $500,000 for CRF. OIREC hired two science advisors; one specializes in nutrition, and the other is a science advisor for agriculture, fragility, and conflict. OIREC also hired an animal scientist who specializes in livestock; that person will report for duty in FY 2020. OIREC also supported short-term consultancies, hired to fulfill short-term international collaborative research needs at USAID.

NAPA Review of PASA Agreement

OIREC manages the PASA agreement, which is intended to support both USAID's international development objectives and ARS' research mission. In FY 2019, OIREC initiated a project with the National Academy of Public Administration (NAPA) to assess the merits and challenges of the current PASA, with the goal of supporting an arrangement that provides value both to USAID and to ARS by supporting and strengthening components of ARS' research and knowledge transfer program. NAPA will provide the final report in FY 2020.

Interns at OIREC

During FY 2019, OIREC hosted three interns from the University of Maryland who were interested in pursuing careers in international relations, agriculture, public health, and science. The interns completed a review of ARS' research on guayule as a rubber substitute, helped create new pamphlets and outreach materials, and joined OIREC staff at Poster Day at the National Agricultural Library. The interns met with Dr. Chavonda Jacobs-Young, ARS Administrator, to learn about career development and working in the field of Federal agricultural research.



Clockwise from bottom left: bagasse, liquid latex, colored latex samples, and a glove, all products from the guayule plant.

Communication and Outreach

Site Visits

In fiscal years 2018 and 2019, OIREC partnered with Area Office leaders to identify ARS locations of varying sizes with strong levels of international engagement. Bryan Norrington, OIREC Director, visited several of the locations[1] that were identified to engage with ARS scientists and researchers and support staff to exchange ideas and to learn which issues and opportunities related to international engagement were most important to them. These meaningful interactions informed the strategic priorities and goals incorporated in the OIREC multiyear strategy for FY 2020–2025. The multiyear strategy is a living document driven by the needs and priorities communicated to OIREC by the ARS community we strive to support.

1 The visits included all five ARS Areas: Pacific West Area (Albany and Davis, California; Pullman, Washington; Maricopa, Arizona), Southeast Area (Stoneville and Oxford, Mississippi), Northeast Area (Newark, Delaware; Wyndmoor, Pennsylvania; Beltsville, Maryland), Plains Area (Fort Collins, Colorado; Bushland and Lubbock, Texas; El Reno, Oklahoma), and Midwest Area (Ames, Iowa; St. Paul, Minnesota).

International Travel and Engagement Training

In FY 2019 ARS, with OIREC in the lead, partnered with the Office of the Director of National Intelligence to develop a new AgLearn-based course, "ARS International Engagement and Travel Awareness." This training is now required annually for those ARS employees who travel internationally for official business. The training presents the steps for preparing for international travel, issues to be aware of during travel, and processes for developing collaborative research activities with foreign partners.

Enhancing Collaboration with USDA Foreign Agricultural Service Foreign Service Officers

The USDA Foreign Agricultural Service (FAS) links U.S. agriculture to the world to enhance export and global food security. Foreign service officers are posted across the globe, and are the front-line professionals representing the U.S. Department of Agriculture as diplomats in 93 U.S. missions covering 171 countries. Foreign service officers are critical to ARS international engagement. Since 2017, OIREC has partnered with the FAS Office of Foreign Service Operations to promote awareness of ARS research at FAS and among foreign service officers; this outreach has included attending training seminars for foreign service trainees to speak about ARS' work and OIREC's role. In 2019 OIREC organized a tour for a group of trainees to the Beltsville Agricultural Research Center (BARC) where they toured the National Agricultural Library and several BARC laboratories, and heard presentations from researchers. The group had a unique opportunity to learn firsthand about ARS research and resources, and to discuss ways that ARS and FAS can work together overseas.

Redesign OIREC Axon site

OIREC staff worked with the Axon team to completely redesign the OIREC Axon site, incorporating input from staff and stakeholders. The new Axon page has an intuitive, user-friendly layout which includes team contact information, the countries managed by each international affairs specialist, actionable information regarding international travel and engagement with foreign partners, external funding opportunities, and updated information about the Overseas Biological Control Laboratories.

Foreign Visitor Task Force

The ARS Foreign Visitor Task Force, headed by OIREC Director Bryan Norrington and Homeland Security Division Director Jeff Hayes, worked to prepare ARS for the forthcoming release and implementation of the USDA Departmental Regulation "Visitors to USDA, Including Foreign National Vetting." The task force completed a draft policy & procedure document for vetting visitors and foreign nationals, and also an accompanying implementation plan document, with input from the ARS Advisory Groups. With these documents completed in advance of the release of the Departmental Regulation, ARS has clearly and preemptively documented that ARS locations have business processes and practices already in place to comply with Departmental security and vetting requirements and that we are safely hosting visitors and foreign nationals. The advisory groups provided feedback to the task force regarding best practices that ARS offices and laboratories around the country use, and this feedback was incorporated into the implementation plan document.

Asia

U.S.-Pakistan Cotton Productivity Enhancement Program (CPEP)

Initiated in 2011, USAID has provided funds to FAS and ARS for the CPEP to conduct collaborative research on cotton leaf curl virus (CLCuV) in Pakistan, with the objective of mitigating the threat that CLCuV poses to international economic and food security. OIREC provides programmatic support for CPEP. ARS researchers from Stoneville, Mississippi, have partnered with the International Center for Agriculture Research in the Dry Areas (ICARDA), which is administered by CGIAR (formerly the Consultative Group for International Agricultural Research), to work with scientists, farmers, government agencies, and other stakeholders in Pakistan on this initiative, which has successfully contained CLCuV in Pakistan. New resistant lines of cotton have been developed and should be available for farmers in 2021. In addition, CPEP expanded the Farmer Field School program and worked with local organizations to establish separate schools for women and ensure they are sustainable. ARS also developed a new cooperative seed-exchange project with Embrapa (Brazil), and Embrapa scientists are working with colleagues in the United States and Pakistan to develop CLCuV-resistant lines using a second source of resistance that originally comes from Brazil.

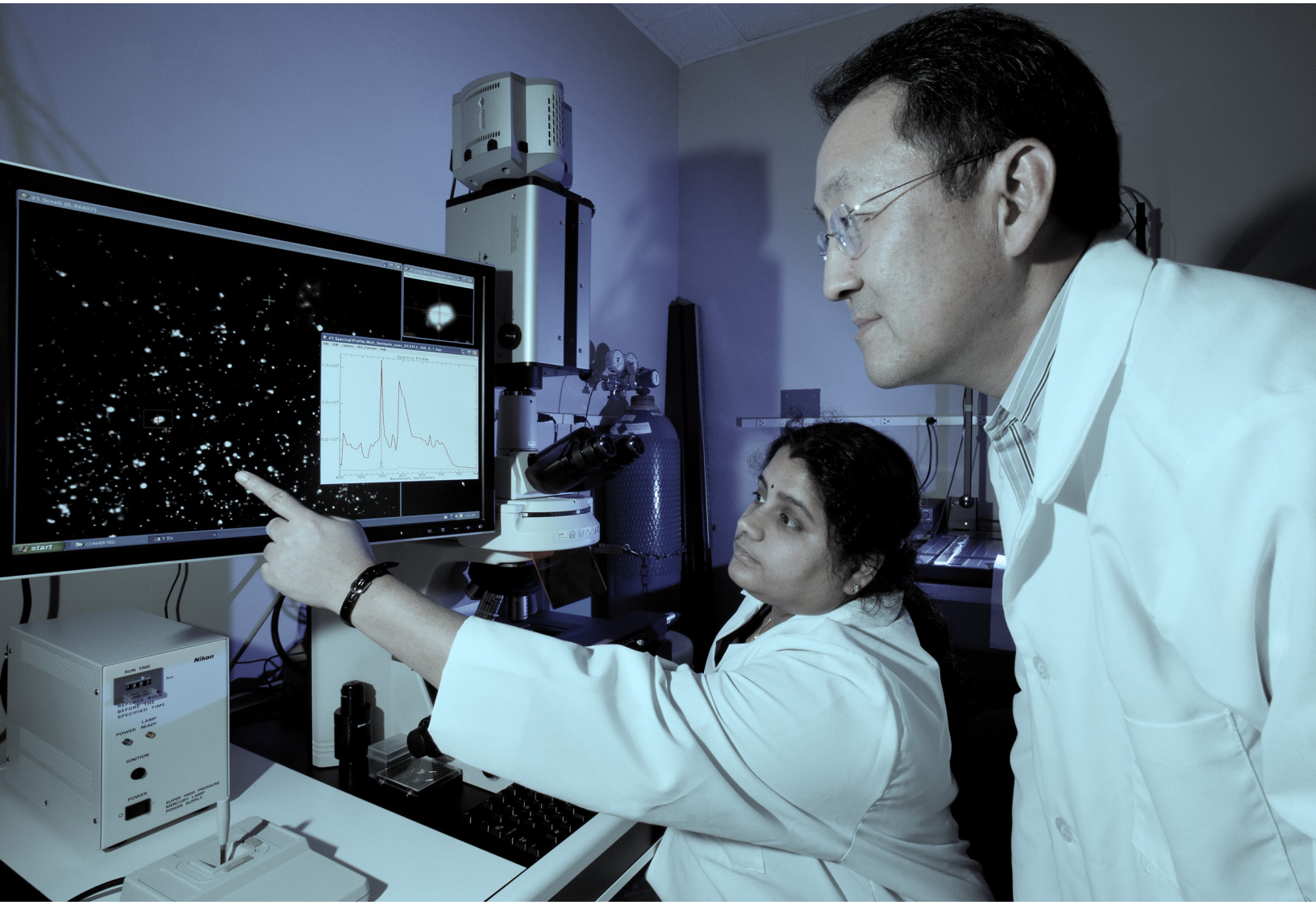
U.S.-Pakistan Wheat Productivity Enhancement Program (WPEP)

Initiated in 2011, USAID provides funds to FAS and ARS for the WPEP to conduct cooperative U.S.-Pakistan research to identify, adopt, and establish optimal agronomic management techniques for new, high-yielding and disease-resistant wheat varieties, with particular attention to wheat rusts. OIREC provides programmatic support for WPEP and maintains a cooperative agreement with the International Maize and Wheat Improvement Center (CIMMYT), a CGIAR center, to

provide scientific expertise and on-the-ground project management in Pakistan. Through WPEP, the wheat breeding and pathology programs in Pakistan have been re-established. In FY 2019, in addition to surveying for rust diseases, inspectors expanded their task to recognize other disease and insect problems that may occur in critical locations. This expansion will enable greater front-line surveillance, thereby reducing the risks of a disease becoming widespread. Due to these efforts, the eastern spread of Ug99 wheat stem rust to massive wheat growing areas was halted. Through WPEP, four new wheat varieties were released for production, bringing to 35 the total number of new, high-yielding, disease-resistant varieties developed and released to the farmers in Pakistan.

Collaboration with the Rural Development Administration (RDA) of South Korea

The RDA and the ARS signed a memorandum of understanding (MOU) in 2009 establishing the RDA-ARS Virtual Laboratory (RAVL) that has since been managed by OIREC. RAVL has promoted several joint research programs and facilitated the exchange of South Korean and U.S. scientists. ARS and RDA hold biennial research symposiums to share research results and to discuss new research priorities. The 2019 joint workshop occurred May 5–9, 2019, at RDA headquarters in Jeonju, South Korea, organized by coordinators John Shekailo and Bongnam Chung under the theme "Application of Sensing Technology in Agriculture." Six ARS science delegates were headed by OIREC Director Bryan Norrington and four RDA representatives were led by Director General Jiweon Lee. RDA and ARS acknowledged that artificial intelligence and sensing technology are key technologies in the future of agriculture. Two projects were highlighted for their successful use of image analysis, one involving hyperspectral imaging for better food safety and one that used crop growth model imaging.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CABI is an international, not-for-profit, science-based, development and information organization that researches natural ways of controlling pests, and it has been helping to lead the effort against corn rootworm's European invasion.

Europe and Eurasia

Collaboration with Uzbekistan to Combat *Fusarium* Wilt Disease

OIREC received funding from the U.S. Department of State to support a collaborative research project between ARS and partners in Uzbekistan aimed at mitigating the threat that *Fusarium* wilt poses to cotton production. The project is expected to enable identification of *Fusarium*-resistant cotton germplasm, develop recommendations for cotton breeding programs in the United States and Uzbekistan, and allow the researchers to better understand the pathogen's origins and mode of infection. ARS implements this project through three ARS locations and several university partners and the project is centrally managed by OIREC. In FY 2019 OIREC completed a nonassistance cooperative agreement with the Center of Genomics and Bioinformatics, the primary implementer in Uzbekistan, to provide funding support for research activities and travel.

Partnership with the Centre for Agriculture and Biosciences International (CABI)

OIREC completed two cooperative agreements with CABI's center in Switzerland to support USDA's biological control programs for invasive weeds. With funds provided by the Animal and Plant Health Inspection Service (APHIS), CABI will conduct exploration missions to identify natural enemies for high-priority invasive plants and weeds, prepare updates for the Invasive Species Compendium, and finalize the peer-reviewed publication of the International Union for the Conservation of Nature systematic review of critically endangered species that are affected by invasive species. USDA will provide this critical information to farmers, States, and Federal invasive species experts, enabling them to take action to prevent, control, or eradicate these pests from U.S. agricultural crops.

Middle East and North Africa

U.S.-Israel Binational Agricultural Research Fund (BARD) Annual Meeting

As a member of the BARD Board of Directors, ARS Administrator Chavonda Jacobs-Young travels annually to Tel Aviv to participate in the board's annual meeting. Her role is supported by the OIREC Director, who also participates in the annual meetings. These meetings serve as the third and final round of evaluations for that year's BARD proposals where finalists are chosen for funding and to determine the priority areas of collaboration for the next year's funding cycle. In June 2019, the board reviewed preliminary findings for BARD's 40-year review, discussed strengthening BARD's impact by partnering with other U.S.-Israel funding programs, and planned fellowships and workshops for FY 2020.

BARD 40th Anniversary

BARD was established to advance, foster, and fund cutting-edge research carried out jointly by U.S. and Israeli researchers. To commemorate 40 years of activity in 2019, BARD commissioned a comprehensive and systematic review to measure the academic and economic impacts of its investments. The review will evaluate BARD's impact on academic outcomes and agricultural applications, both those that have applied knowledge with limited commercial impact and those that have delivered significant economic impact. OIREC is working on a plan with BARD to disseminate this report's important findings.

Technology Transfer Workshops

On September 10, 2018, OIREC hosted 10 Egyptian technology transfer specialists in coordination with the Egyptian Academy of Scientific Research and Technology (ASRT) at USDA's National Agricultural Library. The event featured 3 days of presentations, roundtable and panel discussions, case studies, and simulations that provided participants with a thorough overview of the intellectual property and technology transfer framework in the United States and Egypt, and the various considerations that go into creating an innovation ecosystem. As a follow-up to that workshop, ARS Office of Technology Transfer (OTT) Assistant Administrator Mojdeh Bahar, OTT Deputy Assistant Administrator Robert Griesbach, and ARS OIREC International Affairs Specialist John Shekailo planned and facilitated a second training in Cairo in June 2019. In cooperation with the ASRT and in partnership with the AUTM Foundation, the ARS team organized industry colleagues from various organizations to volunteer as the workshop's technical trainers. In attendance were technology transfer specialists from the Department of Energy, National Institute of Health, University of Maryland, Salk Institute, Pinnacle Reach LLC, Allen & Associates, and AstraZeneca. Together, they developed and led an agenda that included: strategies for technology marketing, evaluating and triaging invention disclosures, marketing abstracts, Bayh Dole Act, Federal Technology Transfer Act (FTTA) and Stevenson-Wyler Act, technology valuation, local and global networks, success metrics, regional challenges for implementation of effective technology transfer structures, biotechnology, conflict of interest, startup structure, and case studies. The U.S. Department of State provided funding and support for both events through the U.S. Egypt S&T Joint Fund.

Sub-Saharan Africa

MOU with South Africa's Agricultural Research Council

In 2019 OIREC coordinated the renewal of a 5-year MOU with the Agricultural Research Council of South Africa (ARC), the principal agricultural research institution in South Africa. For many years, ARS and ARC cooperation has been mutually beneficial with several completed and ongoing activities such as the Feed the Future (FtF) goat improvement initiative, and the foot-and-mouth disease virus surveillance and vaccine development project. This is the third such consecutive MOU between ARS and ARC. It will enhance engagement to further collaborations in agricultural research technical cooperation in strategic areas for both institutions.

Whitefly Control

This project brings together researchers from ARS laboratories in Salinas, California; Charleston, South Carolina; and Fort Pierce, Florida, in collaboration with scientists from the International Institute of Tropical Agriculture (IITA) in Tanzania and Kenya. USAID funds the project through its FtF global food security initiative. The cooperators have developed a novel technology that results in high mortality of the whitefly, offering potential to reduce populations of whiteflies in sub-Saharan Africa and is a major step toward improving management of whitefly and whitefly-transmitted diseases in cassava and other crops. This project was selected by the ARS Office of Communications for inclusion in the 2020 edition of ARS Scientific Discoveries.

Combatting Aflatoxin

The fungal pathogen *Aspergillus flavus* causes ear rots in maize, and produces a toxin that causes stunting, immune system suppression, cancer, and in high doses, immediate death in people and livestock who consume it. With FtF funding from USAID ARS scientists at the ARS Corn Host Plant Resistance Research Unit in Mississippi have worked with partners at IITA, the CIMMYT, and the Council for Scientific and Industrial Research (CSIR) to create breeding lines that are resistant to the fungus and map the genes that cause resistance. The research team has created a new analysis tool called Pathway Association Study Tool (PAST), which allows the discovery of biological mechanisms that maize is using to resist the *A. flavus* fungus; this tool has been released as a free and publicly available tool. Two other biotic stresses, maize lethal necrosis and fall armyworm, were also addressed by the project collaborators. The principal investigator representing ARS, Dr. Marilyn Warburton, received funding from the USAID Partnerships for Enhanced Engagement in Research (PEER) program to travel to Ghana and train local scientists in the measurement of aflatoxin, use of genetic markers, and incorporation of these materials into their ongoing breeding activities.

Western Hemisphere and Oceania

Procinorte Annual Board of Directors Meeting

OIREC worked with the Rangeland Management Research Unit and the Southwestern Cotton Ginning Research Laboratory, both in Las Cruces, New Mexico, to host the annual trilateral (Canada, Mexico, United States) board of directors meeting for Procinorte, the Cooperative Research Program in Research and Technology for the Northern Region. At the November 2019 meeting, ARS was represented by the associate administrator for national programs, the deputy administrator for natural resources and sustainable agricultural systems, and OIREC's international affairs specialist for the Western Hemisphere. Each year the board reviews the progress of the task forces working in plant health, animal health, genetic resources, and fruit quality and determines actions for the coming year. ARS has been the U.S. representative to Procinorte since 2008 alongside Federal counterparts at the National Institute of Forestry, Agriculture and Livestock (INIFAP) in Mexico, and the Agriculture and Agri-Food Canada-Science and Technology Branch, with an Executive Secretariat provided by the Inter-American Institute for Cooperation on Agriculture. This annual meeting supports research cooperation with America's border-sharing neighbors and fosters inter-institutional relationships.

Embrapa/LABEX

LABEX-USA is the "virtual laboratory" where Brazil's agricultural research agency, Embrapa, places researchers in ARS laboratories. LABEX operates through a Trust Fund Cooperative Agreement between Embrapa and OIREC. Building on the original ideals of leading-edge collaboration topics under Labex, ARS researchers are examining future research agendas in digital transformation in agriculture, from big data to precision agriculture and advanced biology. After 20 years, the ARS-Embrapa relationship has evolved from purely research collaboration to sharing insight on management of large science agencies. Given the similarities in size and budget between ARS and Embrapa, and each agency's role as a public sector agricultural research agency, additional opportunities have been identified to learn from each other in areas such as strategic planning, priority setting, and scientific communication. Labex is in the process of transitioning from an in-residence model in which Embrapa researchers might work 2 to 4 years inside an ARS research unit, to a model in which paired researchers meet once or twice a year for a few weeks or months to develop, plan, and review progress, and conduct field work, then return home to collaborate remotely.

OIREC welcomed Dr. Alexandre Varella, Labex's new on-site coordinator in August 2019. Dr. Varella comes from Embrapa as the Director of the Southern Live-stock unit, where he had worked since 2011. As a researcher, he led research projects on silvipastoral systems with emphasis on pasture growth and pasture physiology and management.

Overseas Biological Control Laboratories (OBCLs)

The OBCLs support the domestic research carried out by ARS with the aim of finding solutions to agricultural problems that affect Americans. These laboratories work in countries that are the native homes of many plants and insects that are invasive in the United States. OBCL researchers identify and evaluate natural enemies of these invasive pests with the goal of limiting or eliminating the invasive organisms and reducing the damage they do to U.S. agriculture and public health.

The European Biological Control Laboratory (EBCL) is an ARS facility with locations in Montpellier, France, and Thessaloniki, Greece. The other three OBCLs operate through cooperative agreements with partner organizations: the Sino-American Biological Control Laboratory (Sino-ABCL) in Beijing, China, Chinese Academy of Agricultural Sciences; the Foundation for the Study of Invasive Species (FuEDEI) in Hurlingham, Argentina; and the Australian Biological Control Laboratory (ABCL) in Brisbane, Australia, which is part of the Commonwealth Scientific and Industrial Research Organization.

Coordination of the OBCLs is a joint effort among the in-country OBCL directors, the OIREC Director who also serves as the OBCL area director, the Office of National Programs OBCL national program leader, and OIREC staff.

European Biological Control Laboratory (EBCL)

EBCL 100th Anniversary

The EBCL, which had its 100th anniversary in 2019, plays a critical role in ARS' important research on invasive pest management. The research team at EBCL develops biological control technologies that can be used to control invading weeds and insect pests. In April 2019, EBCL coordinated an event to commemorate the anniversary, which was attended by ARS Administrator Chavonda Jacobs-Young and other ARS leaders. The program showcased how entomologists, plant scientists, and their international partners conduct their cutting-edge research, which is made possible by EBCL's location and facilities. EBCL also hosted international partners and stakeholders including U.S. Consul General Gregory Pfleger from Thessaloniki, Greece, U.S. Consul General Simon Hankinson from Marseille, France, and former EBCL directors who spoke about the evolution of the research program at EBCL and how biocontrol agents collected and evaluated at the EBCL have benefitted U.S. agriculture.

New EBCL Director Selected

Dr. Michael Grodowitz was selected to serve as the next EBCL Director, beginning in August 2020. Dr. Grodowitz is currently the supervisory entomologist/ research leader of the ARS Biological Control of Pests Research Unit in Stoneville, Mississippi. The current director, Dr. Dawn Gundersen-Rindal, will return to her position as research leader of the Invasive Insect Biocontrol & Behavior Laboratory in Beltsville, Maryland, autumn 2020.

EBCL Sabbatical

Dr. Michelle Heck, research molecular biologist at the ARS Emerging Pests and Pathogens Research Unit in Ithaca, New York, was selected for the 2019–2020 EBCL Sabbatical. During her 3-month sabbatical visit to EBCL, Dr. Heck will study the potential for weeds to serve as a reservoir for economically important plant pathogens, mechanisms of weed invasion, and viruses infecting insects used in weed biological control.

Research Highlights

EBCL researchers evaluated potential biocontrol agents of weeds, including swallow-wort, and insects including *Bagrada hilaris*, allium leaf miner, brown marmorated stink bug, olive fruit fly, cattle ticks, and sandfly. Fruit fly and sandfly research was conducted by Dr. Nick Manoukis and Dr. Seth Britch, ARS researchers who received EBCL Sabbatical research funding. EBCL hosted five master's-level students who completed 6-month research internships as part of their degree completion requirement. An additional student conducts research at EBCL as part of his Ph.D. studies. One additional student successfully defended his Ph.D. thesis at the Hassan II Institute of Agronomy and Veterinary Medicine in Morocco, after collaborating with researchers at EBCL. EBCL's Thessaloniki location initiated the EBCL-American Farm School summer internship program. EBCL researchers authored or co-authored 18 publications in peer-reviewed journals.

Foundation for the Study of Invasive Species (FuEDEI)

Research Highlights

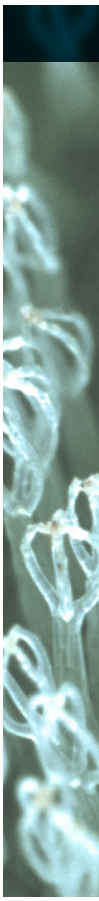
FuEDEI, a longtime collaborator located in Hurlingham, Argentina, focuses on exploring for natural enemies of invasive weeds and insects, performs taxonomic and phylogenetic studies to support development of biological control agents, and identifies the biological and physical parameters that affect the efficacy and safety of potential agents (climatic conditions, host specificity, effective rearing conditions, biogeography). High-priority invasive weeds include water hyacinth, water lettuce, Brazilian waterweed, Brazilian peppertree, water primrose, and giant Salvinia, among others. High-priority pests include black imported fire ant, red imported fire ant, little fire ant, tawny crazy ant, cactus moth, and cactus mealybug. Notable research accomplishments include the following:

Brazilian pepper tree *(Schinus terebinthifolia)*: In July 2019, an ARS laboratory in Florida released a leaf-feeding thrips, the first biological control agent that reduces the growth and reproduction of this noxious weed.

Harrisia cactus mealybug *(Hypogeococcus pungens)*: In May 2019, mealybug parasitoids and their hosts were collected in Paraguay. Exportation permits were obtained to ship two parasitoids to quarantine facilities in Puerto Rico. Field host range studies and preliminary laboratory host specificity tests with the two parasitoids indicate that both species are restricted to the mealybug.

Giant salvinia *(Salvinia molesta)*: A new population of weevil *(Cyrtobagous salviniae)* was located in temperate, southern areas of Argentina, opening possibilities for new, cold-resistant agents to control this invasive weed that produces dense mats over still waters.

Water primrose *(Ludwigia peploides)*: A colony of a thrips to be used as a biocontrol against water primrose was exported and established at the ARS Invasive Species and Pollinator Health laboratory in Albany, California.



This one-tenth-inch-long South American weevil, *Cyrtobagous salviniae*, ***is highly effective in reducing giant salvinia infestations to acceptable levels.***

Australian Biological Control Laboratory (ABCL)

Research Highlights

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a long-time ARS partner. Its aim is to explore for natural enemies, including microorganisms, of invasive weeds and arthropods by performing collections, importations, and exportations in compliance with local and international regulations; performing taxonomic and phylogenetic studies; and identifying the biological and physical parameters that affect the efficacy and safety of potential agents (climatic conditions, host specificity, effective rearing conditions, biogeography). High-priority weeds include a climbing fern *(Lygodium microphyllum)*, ear leaf acacia *(Acacia auriculaformis)*, and mosquito fern *(Azolla pinnata)* and the aquatic weeds Hydrilla *(Hydrilla verticillate)*, yellow floating heart *(Nymphoides peltate)*, crested floating heart *(Nymphoides cristata)*, and water strangler *(Rotala rotundifolia)*. Many of these plants are becoming invasive weeds in Florida and other parts of the United States.

Notable Research Accomplishments:

Earleaf Acacia *(Acacia auriculiformis)*: Biological control agents are urgently needed to control this ornamental shade tree. It is native to Australia and southeast Asia, but it is becoming invasive in Florida. Intensive surveys were conducted in the Northern Territory of Australia to locate herbivorous beetles. One was found: *Calomela intemerata*. A genotype matched to *A. auriculiformis* was shipped to quarantine facilities in Florida in November 2018 for eventual U.S. introduction.

Hydrilla *(Hydrilla verticillate)*: Monoecious hydrilla is spreading into the cooler regions of the United States where the existing introduced biological control agents do not thrive. The native range of hydrilla was extensively surveyed across northern China and South Korea and leaf-mining Hydrellia flies were collected and genetically characterized to identify a Hydrellia fly genotype that was unique to the U.S. monoecious hydrilla genotype and adapted to cooler climates. The genotype was imported into quarantine in Brisbane Australia in 2018, and host range and efficacy testing has begun.

Sino-American Biological Control Laboratory (Sino-ABCL)

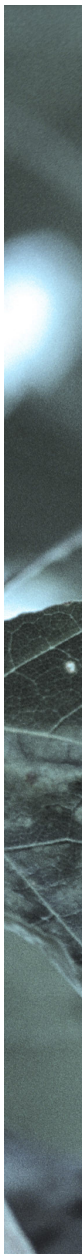
Sino-ABCL 30th Anniversary

The Sino-ABCL identifies and evaluates potential natural enemies of pest insects, weeds, and plant diseases that affect Chinese and U.S. agriculture. The Sino-ABCL reached its 30th anniversary in 2018. The initial cooperative agreement between ARS and the Chinese Academy of Agricultural Sciences was signed in Beijing in 1988. In the past three decades, the Sino-ABCL has carried out more than 16 research projects including studying the behavior and control of the Asian longhorned beetle and surveying wheat stem sawfly parasitoids. More than 260 U.S. research scientists and government officials have visited Sino-ABCL for information exchange and training programs. Over the years, numerous Sino-ABCL research scientists have visited ARS laboratories for training programs and research activities. To commemorate the 30th anniversary, Sino-ABCL Director Chenxi Liu attended the November 2018 joint meeting of the Entomological Society of America in Vancouver, British Columbia, where he gave a presentation that highlighted the laboratory's long history of cooperative research activities.

Research Highlights

Sino-ABCL research in FY 2019 included activities for several target species. Researchers surveyed and identified natural enemies of Asian citrus psyllid in China, and mass reared predators as agents to control it. Researchers also investigated the distribution and natural enemy complex of the Roseau cane scale in China, studied how *Arma chinesis* could be used to control fall armyworm, and assembled the genome of *A. chinensis* using high-technology sequencing. Research was also conducted on natural enemies of *Halyomorpha halys*, the brown marmorated stink bug.

The Sino-ABCL also helped the Hymenoptera Unit of the ARS Systematic Entomology Laboratory, a partner with the Smithsonian Institution's National Museum of Natural History, with a primary indoor evaluation of chestnut gallwasps and oak gallwasps and processed the permits for specimens to be transferred to the United States.



Other Initiatives

Feed the Future

Since 2011, the ARS-USAID PASA has provided funding to ARS for research projects that support ARS' research mission and USAID's development goals for food security under the FtF program. OIREC manages the financial and reporting aspects of these projects, which are implemented by ARS laboratories across the country. Funded projects have included studies of whitefly genomics; livestock improvement and goat genomics; East Coast fever vaccine development; aflatoxin control in maize and peanuts; improving grain legumes; wheat stem rust and wheat blast control; and fall armyworm control. In FY 2019 the wheat blast and grain legume improvement projects concluded.

Tetrapartite Meeting

In March 2019, ARS hosted leaders of the agricultural research agencies of France, Canada, and the United Kingdom for the annual Tetrapartite meeting. This meeting is an annual forum at which Federal agricultural research executives discuss emerging science, program, and agency management policy issues and trends common to and of mutual interest to the national research agencies in the four countries. The objective is to share experiences as national-level agencies and learn from each other how to best deal with these common issues and challenges. OIREC worked alongside the ARS Pacific West Area Office, hotel event staff, and local industry to execute a successful meeting in Lodi, California, where participants discussed facilities maintenance, advanced breeding techniques, and grape and tree crop systems in a changing environment.

International Biosafety and Biocontainment Symposium

The 5th International Biosafety and Biocontainment Symposium took place on February 11–14, 2019, in Baltimore, Maryland. Subject matter experts from around the world met to discuss issues and educational issues on biorisk and facility challenges in agriculture. OIREC Director Bryan Norrington served on the steering committee for this event, and OIREC helped secure funding for international participants from partner countries to attend. Javid Kashefi, an entomologist at EBCL's Thessaloniki, Greece, laboratory, delivered a presentation on cattle tick fever.

Global Foot-and Mouth Disease Research Alliance (GFRA)

OIREC continued to support ARS' activities with the GFRA, a global research alliance that brings together experts from diverse agricultural sectors to combat the threat of foot-and-mouth disease. In FY 2019, OIREC helped secure funding from the U.S. Department of Defense's Biological Threat Reduction Program to support the participation of international researchers in the GFRA annual scientific meeting. OIREC continues to liaise with the Office of National Programs, Grants and Agreements Management Branch, and the U.S. Department of State to facilitate the entry of new country partners into the GFRA.

Global African Swine Fever Research Alliance (GARA)

Like the GFRA, GARA is an international research consortium of researchers and other partners and stakeholders. In FY 2019, OIREC helped secure U.S. Department of Defense funding to support international participation in GARA's 2019 and 2020 annual scientific meetings. OIREC also worked with the Office of National Programs to successfully apply for funding from the FAS to support research activities on African swine fever in cooperation with China, and secured the necessary U.S. Government approvals for this collaborative work under the auspices of the GARA.

International Fellowships and Research Programs to Foster Collaboration

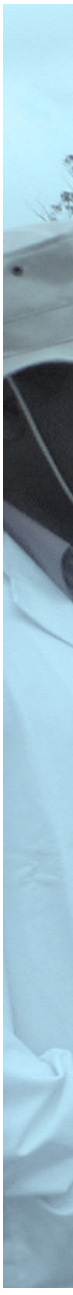
The Borlaug International Agricultural Science and Technology Fellowship Program

The Borlaug International Agricultural Science and Technology Fellowship Program promotes agricultural productivity, food security, trade, and economic growth by providing training and collaborative research opportunities to early and mid-career scientists, researchers, or policymakers from developing and middle-income countries. The Borlaug program is implemented by the FAS Office of Capacity Building and Development, Trade and Scientific Exchanges Division.

OIREC has been working to increase awareness of the program by explaining the requirements for hosting Borlaug Fellows through fact sheets, FAQ documents, and webinars. In FY 2019, OIREC consulted with staff in the Office of National Programs to identify ARS researchers who could host three Borlaug Fellows and assisted with the host application process. A Fellow from the Republic of Georgia was hosted by the Northern Plains Agricultural Research Laboratory in Sidney, Montana, to study the use of fungi to control wheat rust; a Fellow from Sri Lanka was hosted by the San Joaquin Valley Agricultural Sciences Center in Parlier, California, to study the use of moth pheromones for reducing post-harvest loss; and a Fellow from Indonesia was hosted by the Arid Land Research Center in Maricopa, Arizona, to study remote sensing.

The Climate, Food and Farming–Global Research Alliance Development Scholarships (CLIFF-GRADS)

The Climate, Food and Farming–Global Research Alliance Development Scholarships (CLIFF-GRADS) is an international scholarship program that builds the capability of early career scientists and graduate students from developing countries to conduct applied research on climate change

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mitigation in agriculture. It is a joint initiative of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) low-emissions development research, and the Global Research Alliance on Agricultural Greenhouse Gases (GRA).

OIREC facilitates communication on program implementation between ARS host scientists and the fellowship coordinating/funding institutions. In 2019, 5 of the 33 fellowships announced were hosted by ARS research locations for Fellows to work alongside greenhouse gas emissions and mitigation scientists. A Fellow from Brazil was hosted by the Sustainable Agricultural Systems Laboratory in Beltsville, Maryland; a Fellow from Benin was hosted by the Fort Keogh Livestock & Range Research Laboratory in Miles City, Montana; two Fellows (one from Pakistan, one from Ghana) were hosted by the Soil and Water Conservation Research Unit in Pendleton, Oregon; and one Fellow from Nigeria was hosted by the Northern Plains Agricultural Research Laboratory in Sidney, Montana.

The Mandela Washington Fellowship for Young African Leaders

The Mandela Washington Fellowship for Young African Leaders is a program of the U.S. Department of State's Bureau of Educational and Cultural Affairs, implemented by the International Research and Exchange Board. The Fellowship is the flagship program of the Young African Leaders Initiative, which empowers young people through academic coursework, leadership training, and networking.

In FY 2019, OIREC facilitated placement of a Fellow from Liberia at the ARS Hydrology and Remote Sensing Laboratory in Beltsville, Maryland, for 6 weeks to work on efficient management practices for soil and natural resources. In 2018, OIREC facilitated placement of two Fellows at ARS laboratories. A Fellow from Madagascar was hosted by the Healthy Processed Foods Research Unit in Albany, California, to work on fruit and cheese processing, and a Fellow from Djibouti was hosted by the Crop Improvement and Protection Research Unit in Salinas, California, to work on plant breeding and disease control techniques.

Partnerships for Enhanced Engagement in Research

OIREC is the ARS liaison to the USAID PEER program, which funds collaborative research projects between U.S. Government researchers and their counterparts in developing countries. PEER-funded projects are directed toward research and capacity-building activities on topics with strong potential for development impacts. OIREC supports ARS participation in this program through match-making with partner country scientists and providing administrative support during the highly competitive application process. In 2019, five ARS-led projects were selected to receive PEER funds. These projects will advance ARS' research efforts in controlling sweet potato weevils, developing biopesticides to control aflatoxin in food crops, enhancing postharvest technologies and food safety for fresh tomatoes, increasing iron content in dry beans, and mitigating the effects of mining on soil and rivers.

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Cooperative Research Programme (CRP)

The Organisation for Economic Cooperation and Development funds the CRP to strengthen scientific knowledge and provide relevant scientific information that will inform future policy decisions related to sustainable use of natural resources in agriculture, food, fisheries, and forests. Researchers can apply for CRP funding for long-term fellowships in the laboratories of international partners or to arrange scientific conferences and symposia. OIREC publicizes the funding opportunity throughout ARS and provides information and administrative support to ARS researchers who wish to apply for CRP fellowship and conference funds. During the 2019 funding cycle, one ARS researcher was selected for the highly competitive fellowship award and will spend 14 weeks studying biting fly management at the New Zealand Institute for Plant & Food Research.

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