



## PROGRAM FOR ADVANCED APPROACHES TO COMBAT PESTS AND DISEASES

*The Feed the Future Food Security Innovation Center leads USAID's implementation of the Feed the Future Research Strategy through seven interlinked research, policy and capacity programs aimed at sustainably transforming agricultural production systems. Visit [www.feedthefuture.gov/research](http://www.feedthefuture.gov/research) to learn more.*

The **Program for Advanced Approaches to Combat Pests and Diseases** uses advanced molecular tools to create new animal vaccines and develop crops and animals that are resistant to major pests and diseases.

This research, along with complementary efforts to improve integrated pest management, is critical in developing countries where pests and diseases have devastating impacts on agricultural production and on the livelihoods of smallholders who lack access to agrochemicals.

### RESEARCH IN ACTION

East Coast Fever, a tick-borne cattle disease caused by the parasite *Theileria parva*, kills one animal in Africa every 30 seconds. Currently, 28 million cattle are at risk of contracting this disease. A live vaccine for East Coast Fever is currently in use; however, it requires liquid nitrogen for cold storage, which limits its availability and affordability.

A collaborative effort by USAID, USDA, the Bill and Melinda Gates Foundation and the International Livestock Research Institute is developing an improved, safer and more cost-effective subunit vaccine that will not require a cold chain. When it becomes available, the new vaccine is expected to save smallholder farmers more than \$100 million per year.

### DID YOU KNOW?

- On average, 25 percent of smallholder farmers' livestock die due to preventable infectious diseases, e.g. Newcastle disease, which often results in 100 percent poultry flock mortality.
- Cassava brown streak disease causes heavy losses to cassava production in Africa, with \$75-\$100 million lost in severely affected countries.
- Over 90 percent of the world's wheat acreage is susceptible to virulent wheat stem rusts.
- Cowpeas are one of the most important legumes consumed in West Africa, but the pod borer and other insect pests can reduce cowpea harvests by 50-70 percent.
- Plant diseases of major food crops including wheat, rice, maize, potato, soybean and cassava account for up to 40 percent of pre-harvest losses and in some cases can reduce yields by 100 percent.

**Pest- and Disease-Resistant Crops** – This program area utilizes advanced molecular tools, including marker breeding, genomics and genetic engineering to develop disease-resistant varieties and reduce losses from insect pests. By adding important new pest and disease resistance traits to high-yielding, climate-resilient germplasm and disseminating them together with complementary biocontrol agents and other pest and disease control measures, researchers are offering robust pest and disease solutions to smallholder farmers while helping to reduce the use of potentially harmful or expensive pesticides.

**Animal Vaccines & Disease Management** – This program aims to reduce livestock mortality from preventable diseases by developing new vaccines, as well as

improving existing vaccines by making them more suitable to developing country delivery systems, e.g., more heat-stable and less expensive. Rapid, low-cost diagnostic tools are important for managing and preventing disease outbreaks.



## RESEARCH IN ACTION

**Cassava Mosaic Disease (CMD)** and the more recently observed **Cassava Brown Streak Disease (CBSD)** threaten the production of cassava, a crop especially important to smallholder farmers in East Africa. **CBSD** in particular can generate total yield loss through its effect on edible roots, and causes annual economic losses of \$75-\$100 million in several affected East African countries. In collaboration with the Bill and Melinda Gates Foundation and the Monsanto Fund, **USAID** is supporting efforts by the Donald Danforth Plant Science Center, IITA, and African partners to develop new cassava varieties resistant to both **CMD** and **CBSD**. Using a novel molecular approach known as **RNA interference**, disease-resistant cassava plants have been developed and evaluated in **Uganda** and **Kenya**, where they have shown exceptional resistance to **CBSD** under field conditions.

**Universities** – Feed the Future engages with U.S. and international universities as primary implementing partners to develop, evaluate and deliver technologies. Feed the Future also invests in training and institutional development to strengthen agricultural education and scientific capacity in host country universities and research organizations.

**Private Sector** – The private sector is a key partner in a number of projects utilizing molecular methods for pest and disease control. Private sector companies provide access to new technologies, assist with further development to meet local needs, and help train host country public sector partners in technology development and dissemination.

**International Institutions** – Major international partners, such as the **CGIAR** and other research institutions, provide key linkages to national research systems and host country universities.

**National Partners** – Host country agricultural research, education and training organizations are important partners for research to improve disease and pest control, and for dissemination of new technologies. They work across the **FSIC** pest and disease research portfolio, and are essential to innovation at the farm and field level. National partners also work through sub-regional organizations to identify multi-country needs and coordinate research and capacity building approaches.

**U.S. Government** – Under Feed the Future's whole-of-government approach, **USAID** partners with the U.S. Department of Agriculture's Agricultural Research Service to support research on disease and pest control in animals and plants.

Current Research Projects	Lead Institutions	Countries
<b>CGIAR Research Program - Roots, Tubers and Bananas</b>	International Potato Center	Global
<b>CGIAR Research Program - Livestock and Fish</b>	International Livestock Research Institute	Global
<b>Virus Resistant Cassava for Africa</b>	Donald Danforth Plant Sciences Center	Kenya, Uganda
<b>Agricultural Biotechnology Support Program II</b>	Cornell University	Bangladesh, India, Indonesia, Philippines, Uganda
<b>RNAi approaches to disease resistance in banana, potato, wheat and maize</b>	Venganza, Inc	Global
<b>Feed the Future Innovation Lab for Rift Valley Fever Control in Agriculture</b>	University of Texas, El Paso	Tanzania, Morocco
<b>Feed the Future Innovation Lab for Genomics to Improve Poultry</b>	University of California, Davis	Tanzania, Ghana
<b>Insect Resistant Bt Cowpea</b>	African Agricultural Technology Foundation	Burkina Faso, Ghana, Nigeria
<b>Banana Bacterial Wilt Resistance</b>	International Institute of Tropical Agriculture	Uganda
<b>Late Blight Resistant Potato</b>	International Potato Center	Global
<b>USDA/NBCRI East Coast Fever Vaccine</b>	USDA/Agricultural Research Service	Sub-Saharan Africa
<b>USDA/NBCRI Goat Genomics</b>	USDA/Agricultural Research Service	Sub-Saharan Africa
<b>USDA/NBCRI Wheat Stem Rust</b>	USDA/Agricultural Research Service	Global
<b>USDA/NBCRI Whitefly Resistance</b>	USDA/Agricultural Research Service	Sub-Saharan Africa





## FEED THE FUTURE FOOD SECURITY INNOVATION CENTER

The Program for Advanced Approaches to Combat Pests and Diseases harnesses U.S. scientific expertise and emerging molecular tools to develop new animal vaccines and crops and animals resistant to pests and diseases that cause significant production losses in tropical systems.

The [Feed the Future Food Security Innovation Center](#) leads USAID's implementation of the Feed the Future Research Strategy through seven interlinked research, policy and capacity programs aimed at sustainably transforming agricultural production systems. It is housed within the Bureau for Food Security and is a strategically aligned and integral component of USAID's science and technology programs. The seven programs of the Food Security Innovation Center are:

- **Research on Climate Resilient Cereals** – This program helps smallholder farmers adapt to climate change and build resilience by developing new cereal varieties with enhanced yield and tolerance to drought, heat, salinity and low soil fertility, and delivering these varieties in diversified, sustainable farming systems.
- **Research on Legume Productivity** – This program increases the production and consumption of critical, protein-rich legumes by developing disease- and stress-tolerant, high-yielding varieties, improving market linkages and post-harvest processing, and integrating legumes into major farming systems to improve household nutrition and incomes, especially for women.
- **Research on Nutritious and Safe Foods** – This program links research on the production and processing of safe, nutritious agricultural products to a learning agenda on household nutrition, including the utilization of and access to fruits, vegetables, meat, fish, dairy and legumes with the goals of preventing undernutrition (especially in women and children), improving child survival and securing family investments in agriculture.
- **Markets and Policy Research and Support** – This program works to achieve inclusive agricultural growth and improved nutrition through research on enabling policies, socioeconomic and technology targeting, and by building the capacity of partner governments to effect sustainable change in areas such as land tenure, financial instruments, input policies and regulatory regimes.
- **Sustainable Intensification** – This program works with smallholder farmers to incorporate sustainable, productivity-enhancing technologies and farming practices into major production systems where the poor and undernourished are concentrated and, through intensification and diversification of these systems, to enhance resilience, nutrition and agricultural growth.
- **Human and Institutional Capacity Development** – This program strengthens individuals – scientists, entrepreneurs, educators – and institutions, ensuring that food and agriculture systems in developing countries are capable of meeting the food security challenge and that women in particular are poised to take advantage of new opportunities and provide critical leadership in agricultural research, private sector growth, policy development, higher education and extension services.

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