



## PROGRAM FOR RESEARCH ON LEGUME PRODUCTIVITY

*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 Research on Legume Productivity** focuses on increasing the production and availability of nutritious legumes in order to improve food security, nutrition, soil health and economic opportunities for poor farmers.

Common bean and other legumes provide crucial dietary protein and nutrients to complement cereal staples, but lagging yield gains combined with strong market demand and higher prices for grain and oilseed legumes have made them increasingly unaffordable for poor consumers.

Legumes also enhance soil fertility through nitrogen fixation, making them a central component of sustainable intensification efforts on small farms. Investments in legume productivity research will allow millions of poor farmers to realize nutritional and agricultural benefits from growing, processing and marketing stress-tolerant, higher-yielding legumes.

### RESEARCH IN ACTION



Credit: Rick Brandenburg

Ghanaian scientists and U.S. university faculty collaborating through the Feed the Future Innovation Lab for Collaborative Research on Peanut Productivity and Mycotoxin Control released a new drought-tolerant, pest-resistant peanut variety (pictured left). This new variety's yield is over 50 percent greater than the local variety.

### DID YOU KNOW?

- Legumes are an especially important crop for women, particularly in Sub-Saharan Africa where women are the primary cultivators of legume crops and are directly involved in small-scale processing, preparation and marketing of grain legumes. Women also oversee home consumption of this nutritious food.
- Yields of most legumes grown by African smallholders have barely risen over the past half-century. For example, from 1965 to 2009, common bean yields in Africa remained stagnant at 0.6-0.7 tons per hectare.
- Legumes are extremely vulnerable to abiotic stresses, pests and diseases. The effects of drought, heat and salinity reduce legume yields by up to 40 percent across some Asian and Sub-Saharan African regions, while pests and diseases cut yields by a third or more.
- Cowpeas are an important staple in the diets of 200 million Africans, roughly 18 percent of the population. Smallholders devote more land to groundnuts than any other legume in Sub-Saharan Africa, nearly 11 million hectares.

## RESEARCH AREAS

**Crop Improvement** – To achieve significant gains in legume productivity, researchers are using both traditional breeding and biotechnology tools to improve yields, enhance rates of nitrogen fixation and increase tolerance to abiotic and biotic stresses, including insects and soil-borne pathogens. Major crops of interest include cowpea, groundnut, common bean, soy and chickpea.

**Agronomy** – Improved legume varieties feed into sustainable intensification efforts in South Asia and Sub-Saharan Africa, where research is aimed at integrating legumes for food and fodder into smallholder production systems through crop rotation or intercropping with cereals.

**Pest and Disease Management** – To increase productivity of legume production systems, research emphasizes integrated pest management strategies, including the use of bio-pesticides, natural enemies, and agronomic strategies such as crop rotation and intercropping. Groundnut value chain activities also focus on reducing and eliminating aflatoxin to improve the safety of peanut-based products.

**Marketing, Policy, Impact Assessment** – Efforts to improve key elements of legume value chains seek to improve post-harvest technologies, examine the role of legumes in farming systems, expand smallholder market access and linkages between local producers and processors, and use nutrition education to improve household consumption practices.



## RESEARCH IN ACTION

After harvesting and storing their cowpeas, West African farmers can lose up to 80-100 percent of their crop to weevils and other insects. Thanks to Purdue University researchers participating in a previous phase of the Feed the Future Innovation Lab for Collaborative Research on Grain Legumes, farmers now have another option: triple-bagging their harvested grain in air-tight plastic sacks, which kills the insects and protects the harvest. Since this storage technology was introduced in 2007, extension partners have mounted demonstrations in more than 31,000 West African villages, and nearly two million locally manufactured storage bags have been sold. As a result, post-harvest cowpea losses have plunged on farms that use the practice, increasing farmers' incomes by as much as 20 percent within the first two years.

**Universities** – Specialists from U.S. and partner universities contribute technical expertise to research efforts, particularly through the Feed the Future Innovation Labs, which have strong links to national research centers in partner countries. These programs also provide crucial training opportunities for host country students and scientists, helping to build research capacity in partner countries.

**Private Sector** – Private partners range from large companies that contribute proprietary technologies to local entrepreneurs, input dealers and food processors in partner countries, who strengthen local capacity to increase legume productivity and quality, and safely process peanut-based products.

**International Institutions** – International research organizations, particularly member institutions of the CGIAR, bring vital agricultural research expertise and infrastructure to legume research efforts.

**National Partners** – Agricultural research, education and training organizations are important partners in improving legumes and expanding their adoption among Feed the Future's target beneficiaries. They work across the legume research portfolio, and are essential to innovation at the farm and field level. National partners also work through sub-regional organizations to define national and regional priorities and coordinate research and capacity building efforts.

**Non-Governmental Organizations** – NGOs often execute the training, technology delivery and agricultural extension efforts that translate promising research into results on farms and among small- and medium-sized food processors.

**U.S. Government** – As part of Feed the Future's whole-of-government approach, USAID partners with the U.S. Department of Agriculture's Agricultural Research Service and the National Institute of Food and Agriculture on a variety of legume research projects.

## PARTNERS

| Current Research Projects   | Lead Institutions  | Countries  |
|---|--|--|
| <b>CGIAR Research Program - Grain Legumes</b>   | International Crops Research Institute for the Semi-Arid Tropics | Global   |
| <b>Feed the Future Innovation Lab for Collaborative Research on Grain Legumes</b>                               | Michigan State University  | Benin, Burkina Faso, Ghana, Guatemala, Haiti, Honduras, Malawi, Mozambique, Niger, Uganda, Senegal, Tanzania, Zambia |
| <b>Feed the Future Innovation Lab for Collaborative Research on Peanut Productivity &amp; Mycotoxin Control</b> | University of Georgia  | Haiti, Ghana, Burkina Faso, Malawi, Mozambique, Zambia, India, Senegal, Uganda                                       |
| <b>Feed the Future Innovation Lab for Climate Resilient Cowpeas</b>   | University of California, Riverside                              | Senegal, Burkina Faso, Ghana, Nigeria  |
| <b>Feed the Future Innovation Lab for Climate Resilient Beans</b>   | Pennsylvania State University                                    | Mozambique, Colombia, Malawi, Honduras, Haiti, South Africa  |
| <b>Feed the Future Innovation Lab for Climate Resilient Chickpea</b>  | University of California, Davis                                  | Ethiopia, India, Turkey  |
| <b>Feed the Future Innovation Lab for Soy Value Chain Research</b>  | University of Illinois at Urbana-Champaign                       | Ghana, Zambia, Ethiopia, Malawi, Mozambique  |
| <b>Insect Resistant Bt Cowpea</b>   | African Agricultural Technology Foundation                       | Burkina Faso, Ghana, Nigeria, Malawi   |
| <b>USDA/NBCRI Common Bean Genetic Improvement Project</b>   | USDA/Agricultural Research Service                               | Global   |





## FEED THE FUTURE FOOD SECURITY INNOVATION CENTER

The Program for Research on Legume Productivity 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.

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.
- **Advanced Approaches to Combat Pests and Diseases** – This program 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.
- **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.

Questions? Contact [FTFinnovation@usaid.gov](mailto:FTFinnovation@usaid.gov)