



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



## Feed the Future Legume Innovation Lab Advancing the Productivity Frontier

### Genetic Improvement of Cowpea to Overcome Drought and Biotic Constraints to Grain Productivity

#### The Challenge

In the Sudano-Sahel region of West Africa, low agricultural productivity contributes significantly to rural and urban poverty. Cowpea, a highly nutritious grain legume crop that complements cereals to create a complete protein, is critical to food security in the region, particularly for women and children. However, biotic and abiotic stresses caused by insect pests, diseases, drought, and low soil fertility are primary constraints to better cowpea production, resulting in smallholder farmers' cowpea harvests reflecting just 10 to 20 percent of cowpea's potential.

#### The Project

This project team uses genomics and modern breeding techniques to improve cowpea yield by targeting insect tolerance and resistance traits at all stages of the growing cycle: early (aphids), mid-flowering and pod-



A farmer with her cowpea harvest in Burkina Faso



A healthy cowpea field in Burkina Faso

set (flower thrips), and later (pod-sucking bugs). Specifically, project scientists first identify the gene variations that allow some cowpea plants to perform better than others, in this case for insect resistance, and then locate the genetic regions, called *quantitative trait loci* (QTL), where these traits are found. Once identified, plant breeders then cross various plants that contain several desirable QTLs to create lines with multiple useful traits.

By targeting insect tolerance traits and combining them with drought tolerance or adaptability to low soil fertility, cowpea productivity, food security, and rural incomes can all be increased.

#### This project is funded by

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The project team examines breeding lines growing in Ghana research fields.



The project team examines cowpea seedlings in a screen house designated for insect pest testing.



A cowpea plant infested with aphids.

## Project Objectives

1. Discover quantitative trait loci (QTL) for insect tolerance and resistance, and apply it in molecular breeding for project target regions in West Africa and the United States:
  - a. aphid resistance
  - b. flower thrips resistance
  - c. pod-sucking bugs resistance
2. Complete release and validation of advanced cowpea lines developed under the Dry Grain Pulses CRSP project.
3. Increase cowpea productivity through improved varieties.
4. Strengthen the capacity of National Agriculture Research Stations in Burkina Faso, Ghana, and Senegal to serve the cowpea sector.

## Projected Outcomes

The development and release of numerous improved cowpea varieties with aphid, thrips, and pod bug resistances combined with drought and/or low soil fertility tolerance.

## Major Achievements to Date

1. Formal release of five large white-seeded cowpea varieties (*Lisard*, *Thieye*, *Leona*, *Kelle*, and *Sam*) was completed in Senegal following the final performance testing in on-farm trials. Foundation seed of each variety was produced and distributed to farmers' organizations for Certified Seed development.
2. The mitochondrial genomes of cowpea aphid populations from Ghana and California were fully sequenced and compared.
3. An improved *Melakh* cowpea seed with *Striga* resistance was developed and multiplied for Breeder Seed.
4. The tight genetic linkage between the pinkeye seed trait and one of the key aphid resistance QTLs was broken in a few backcross progeny individuals, allowing the development of aphid resistant blackeye cowpea varieties for the United States.



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