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

FEED THE FUTURE INNOVATION LAB FOR LEGUME SYSTEMS RESEARCH

The Feed the Future Innovation Lab for Legume Systems Research is a five-year research capacity building development program managed by Michigan State University that focuses on grain legumes in West and Southern Africa. Legumes are a nutrient-dense staple crop that have multifunctional roles in smallholder farm systems in developing countries including food and nutrition security, generating income, providing livestock feed and fodder, and contributing to the sustainability of soil systems through their nitrogen-fixing capabilities. Cowpea and common bean are the focal crops of the Legume Systems Innovation Lab.

The Legume Systems Innovation Lab goals include:

- Inclusive and sustainable agriculture-led economic growth
- Strengthened resilience among people and systems
- A well-nourished population, especially among women & young children

The strength of the Legume Systems Innovation Lab's design lies in its innovative and vibrant research to scaling strategy using a systems approach. Supported projects are diverse in research focus and address both the development and placement of innovative technologies with a thorough understanding of the systems they will impact thus leading to successful adoption. Projects are focused in three areas of inquiry:

- Integration of legumes into sustainable smallholder farming systems and agricultural landscapes
- Integration of legumes within local and regional market systems, including trade
- Analysis of sociocultural and/or economic motivators or barriers to legume utilization at various stages and scales within production and market systems

In addition, the Legume Systems Innovation Lab will focus on opportunities that address nutrition; the unique needs of women and youth; ensure greater resilience of people and systems under stress and shocks; and contribute to the development of human and institutional capacity for a resilient agricultural innovation system. Project activities are focused in the Feed the Future target and aligned countries of Benin, Burkina Faso, Ghana, Mali, Malawi, Mozambique, Niger, Nigeria, Senegal, and Zambia.

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PROJECT OVERVIEW:

Genetic Improvement of Dry Beans for Bruchid Resistance for Southern Africa

Principal investigator/Lead institution
Dr. Juan M. Osorno, North Dakota State University

Collaborating institutions
- University of Nebraska, U.S.
- University of Zambia (UNZA), Zambia
- Dept. of Agricultural Research and Technical Services (DARS), Malawi
- Instituto de Investigação Agraria de Mozambique (IIAM), Mozambique

Project Overview

The Southern Africa countries of Zambia, Malawi, and Mozambique have some of the highest levels of poverty and malnutrition worldwide. Agriculture is an important economic activity and among all the crops grown, common bean (*Phaseolus vulgaris* L.) is one the staple crops in terms of both production and consumption.

Southern Africa accounts for ~32% of the total production of common bean in the continent. Despite the economic and nutritional importance, seed yields remain low. Both biotic and abiotic stresses are the main causes of significant losses.

In addition, bean weevils (bruchids) are a post-harvest pest responsible for over 48% loses in quality and quantity of common bean in storage. Only recently, have breeders been able to develop germplasm with resistance to the 2 main species of bruchids. This represents a new and unique opportunity to transfer the resistance (known as the APA locus) into commercial varieties with good agronomic performance and well accepted in this region. Insecticides are available but are expensive and toxic. Also, chemical control is less practiced in Africa because farmers cannot afford pesticides.

Therefore, development and use of weevil-resistant varieties would be the most economical and environmentally friendly control method for smallholder farmers in the region. The University of Zambia Bean Breeding Program has developed 11 breeding populations for resistance to common bean weevil involving parents with commercial seed types acceptable in the region. All these breeding populations are currently at mid-generation stages. Additionally, some of these 11 breeding populations have resistance for economically-important diseases and low soil fertility.

This project will aim to continue testing and selecting this genetic material to develop new bruchid-resistant varieties with good agronomic performance, increasing selection efficiency using modern molecular tools, and improved cooking time. These activities will have direct economic impact in the region not only by offering a new product that can be stored for longer periods of time without losing quality, but also allows households to store beans they can eat safely (food security).

In addition, the project will improve the technical knowledge of bean smallholder farmers, bean scientists, and other stakeholders in the region through training the next generation of plant scientists (breeders) for the region.