



FEED THE FUTURE

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



Legume Innovation Lab



Feed the Future Legume Innovation Lab
Advancing the Productivity Frontier

Genetic Improvement of Middle-American Climbing Beans for Guatemala

The Challenge

Guatemala is mostly a rural country, with 60 percent of its populations living on farms. Maize and beans compose the staple food in most households, with per capita bean consumption of 9.4 kg per year—an insufficient amount of protein for acceptable nutrition, especially within poor households.

Chronic malnutrition is frequent (67 percent) among children under five in the western highlands. One-third of children six to 59 months show evidence of anemia, along with 18 percent of reproductive-age women, 29 percent of pregnant women, and 23 percent of breastfeeding women.



Julio Villatoro evaluating black bean breeding lines for resistance to anthracnose and other diseases.



Climbing bean field at ICTA-Chimaltenango station showing crosses (white tags), with the fuego (fire) volcano in the background.

Beans grown in Guatemala's highlands are mostly climbing beans, which grow around the corn they're planted with as part of the traditional *milpa* system. Unfortunately, on-farm productivity of these climbing beans is approximately one-third their genetic potential, mostly due to bean varieties unable to withstand biotic and abiotic stresses. Pests and diseases are the main cause of yield reductions.

The Project

Using an existing ICTA collection of 600 accessions of climbing beans from growing regions throughout Guatemala, researchers are working to develop germplasm with improved disease and insect pest resistance as well as greater yield potential. The resulting lines will be released into the Western Highlands communities to improve diets and nutritional health.

LOCALIDAD	DEPARTAMENTO
1. PAXTOCA	TOTONICAPÁN
2. CHUISUC	TOTONICAPÁN
3. SAN ANTONIO SIJA	TOTONICAPÁN
4. XESEA	TOTONICAPÁN
5. PATACHAJ	TOTONICAPÁN
6. CHOQUI ALTO	QUETZALTENANGO
7. OLINTEPEQUE	QUETZALTENANGO
8. SJ OSTUNCALCO	QUETZALTENANGO
9. SP SACATEPEQUEZ	SII MARCOS
10. CHIANTLA	HUEHUETENANGO
11. SIN SEBASTIAN	HUEHUETENANGO
12. SANTA POLONIA	CHIMALTENANGO
13. COMALAPA	CHIMALTENANGO
14. TECPAN	CHIMALTENANGO
15. EL TEJAR	CHIMALTENANGO
16. ZARAGOZA	CHIMALTENANGO
17. LABOR OVALLE	QUETZALTENANGO



A list of climbing bean trials (location and department) made during the 2015 growing season in the Guatemalan highlands

Close-up of a cross from the greenhouse at ICTA-Chimaltenango

Project Objectives

1. Development of germplasm with improved disease resistance and agronomic performance.
2. Characterization of the genetic diversity of this unique set of germplasm.
3. A better understanding of the current socioeconomic status and needs of bean production within the context of intercropping systems in the region.

Projected Outcomes

1. The development and release of improved climbing beans with better agronomic performance.
2. A better understanding of the organization of the genetic diversity within this unique set of germplasm.
3. Identification of genomic regions associated with traits of agronomic and economic importance.
4. A database of the current market and production needs of climbing beans in Guatemala's highlands.
5. Training of the next generation of plant breeders.
6. Establishment of a long-term breeding approach.

Major Achievements to Date

1. Establishment of a breeding pipeline and first set of crosses.
2. Initial molecular characterization (DNA extraction) of the climbing bean collection.
3. Collection of seed samples from surveyed growers and seed increases in the greenhouses.



MICHIGAN STATE
UNIVERSITY



Lead U.S. Principal Investigator (PI)

Juan Osorno

Professor

North Dakota State University

Email: juan.osorno@ndsu.edu

U.S. and HC Co-PIs and Collaborators

Phil McClean, North Dakota State University

Julio C. Villatoro, **Edgardo Carrillo**, **Angela**

Miranda, and **Jessica Moscoso**

ICTA-Guatemala

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Feed the Future Legume Innovation Lab

Michigan State University

Email: legumelab@anr.msu.edu

Website: www.legumelab.msu.edu