

# Common Bean Improvement in Central America

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The common bean is a component of the traditional diet and the principal source of protein for low income families in Central America. The seed types preferred by consumers in the region are small red and black beans (Table 1). Nicaragua, Guatemala and Honduras are the largest bean producers in the region.

Diseases that limit bean yield in Central America include Bean Golden Yellow Mosaic Virus (BGYMV), Bean Common Mosaic Virus (BCMV), angular leaf spot caused by *Phaeoisariopsis griseola* (Sacc.) Ferr., anthracnose caused by *Colletotrichum lindemuthianum*, rust caused by *Uromyces appendiculatus*, common bacterial blight caused by *Xanthomonas axonopodis* pv. *phaseoli* and web blight caused by *Thanatephorus cucumeris*. Bean Common Mosaic Necrosis Virus (BCMNV) represent a potential threat to bean production in the region.

The principal pests include leafhoppers (*Empoasca kraemerii*), cut worms (*Phyllophaga* spp., *Agrotis* spp., *Feltia* spp.), slugs (*Sarasinula plebeia*); leaf beetles (*Cerotoma* spp., *Diabrotica* spp.), leaf eaters (*Spodoptera* spp., *Anticarsia gemmatalis* a), pod borer (*Trichapion godmani*) and bruchids (*Acanthoscelides obtectus* and *Zabrotes subfasciatus*).

Terminal drought, high temperature and low soil fertility are abiotic factors that limit bean production in the region. The high cost of inputs, poor roads that limit access to markets and competition from imported beans are socio-economic factors that threaten local production of beans.

With support from the Bean/Cowpea CRSP and, in recent years, the Dry Grain Pulse CRSP, bean researchers at the Escuela Agrícola Panamericana (Zamorano), the Universities of Puerto Rico (UPR), Nebraska and Pennsylvania State and USDA-ARS/TARS have collaborated with CIAT and the National Bean Research (NBR) programs of Central America to develop and release bean cultivars and improved germplasm for Central America (Beaver et al., 2003; Rosas et al., 2004). The focus of bean breeding activities has been the development of adapted cultivars having a preferred seed type and enhanced levels of disease resistance (Table 2). More than 15 common bean cultivars have been developed and released using conventional and participatory plant breeding (PPB) approaches in collaboration with NGOs and farmer local agricultural research committees (CIAL) in Honduras and farmer cooperatives in Nicaragua ([www.programa-fpma.com](http://www.programa-fpma.com)).

Several of the bean cultivars developed and released from this collaboration have gained wide acceptance in Central America. More than 150,000 bean producers in the region are estimated to be planting cultivars that were developed with support from the CRSPs. Advanced breeding lines currently being developed and tested should produce cultivars with resistances to additional diseases and pests (BCMNV, angular leaf spot) and greater tolerance to abiotic stress (drought and low soil fertility).

## References

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Table 1. Bean production in Central America.

Country	Area of production (ha)	Production (MT)	Seed yield (kg/ha)	Preferred seed types
Costa Rica	12,000	8,000	667	Small black and red
El Salvador	95,000	99,000	1,043	Small red
Guatemala	171,000	133,000	778	Small red
Honduras	140,000	108,000	772	Small black
Nicaragua	229,000	169,000	738	Small red
Central America	647,000	517,000	799	

Table 2. Cultivars and improved germplasm developed by Zamorano, the UPR, the USDA-ARS and Central American National Bean Research programs.

Name (year of release)	Seed type	Institutions	Characteristics
ICTA Sayaxche (2010)	Small black	EAP/ICTA-Guatemala	Resistant to BGYMV ( <i>bgm</i> , <i>QTL</i> ), BCMV ( <i>I</i> ), ALS ( <i>Phg1,2</i> ) and rust ( <i>Ur6,7,11</i> ), high yielding
ICTAZAM (2010)	Small black	EAP/ICTA-Guatemala	Resistant to BGYMV ( <i>bgm</i> , <i>QTL</i> ), BCMV ( <i>I</i> ), ALS ( <i>Phg1,2</i> ), rust ( <i>Ur7</i> ) and web blight
Surú (2009)	Small white	EAP/PITTA-Costa Rica	Resistant to BGYMV ( <i>bgm</i> y <i>QTL</i> ) and BCMV ( <i>I</i> ), high market price
CENTA CPC (2008)	Small red	EAP/CENTA-El Salvador	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg1,2</i> ), rust ( <i>Ur3,7</i> ) and heat tolerant
Tonjibe (2007)	Small red	EAP/PITTA-Costa Rica	Resistant to BGYMV ( <i>bgm</i> y <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> )
DEORHO (2007)	Small red	EAP/UPR/DICTA-Honduras	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> ), rust, ( <i>Ur3</i> ), wide adaptation, high yielding
Cardenal (2007)	Small red	EAP/UPR/DICTA-Honduras	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> ), rust ( <i>Ur3</i> )
Curré (2006)	Small red	EAP/PITTA-Costa Rica	Resistant to BGYMV ( <i>bgm</i> y <i>QTL</i> ) and BCMV ( <i>I</i> );
Gibre (2006)	Small red	EAP/PITTA-Costa Rica	Resistant to BGYMV ( <i>bgm</i> y <i>QTL</i> ) and BCMV ( <i>I</i> )
CENTA Pipil (2005)	Small red	EAP/CENTA-El Salvador	Resistant to BGYM ( <i>bgm1</i> and <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg1,2</i> ), rust ( <i>Ur3, 6,7,11</i> ), heat tolerant, high yield
Carrizalito (2003)	Small red	EAP/UPR	Resistant to BGYM ( <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> ), rust ( <i>Ur3,7</i> ), highland adaptation, high yield
Amadeus 77 (2003)	Small red	EAP/UPR	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ), BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> ), rust ( <i>Ur3,4,5,7,11</i> ), wide adaptation, heat tolerant
INTA Precoz (2003)	Small red	EAP/INTA-Nicaragua	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ), BCMV ( <i>I</i> ), earliness, tolerant to drought
INTA Estelí (2001)	Small red	EAP/CIAT/INTA-Nicaragua	Resistant to BGYM ( <i>QTL</i> ) and BCMV ( <i>I</i> )
Bribri (2000)	Small red	EAP/PITTA-Costa Rica	Resistant to BGYMV ( <i>QTL</i> ) and BCMV ( <i>I</i> ), tolerant to low fertility
Tío Canela 75 (1996)	Small red	EAP/UPR	Resistant to BGYMV ( <i>bgm</i> and <i>QTL</i> ) and BCMV ( <i>I</i> ), ALS ( <i>Phg2</i> ), wide adaptation