# Zimbabwe

## Common bean

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## Introduction

### Importance of the crop in Zimbabwe

Common bean (*Phaseolus vulgaris*) is a well known protein source which is consumed directly by many people in Zimbabwe. Beans are mainly consumed as dry or fresh grain, and are currently promoted based on high micronutrient (Zn and Fe) content, which suits malnourished children, pregnant women and young children. Common bean is among the top five crops that provide a high income to farmers and traders. The crop is traded in informal markets as well as in supermarkets. On average Mbare market (Musika) trades dry beans worth US$ 10,000 a month. Dry packed grain as well as locally canned beans are common in supermarkets. The price for grain at informal markets ranges from US$ 800 to US$ 1,000 per ton depending on quality of the grain. Trade is not limited within the country but is expanded to South Africa, Malawi, Zambia, Mozambique and Tanzania.

The level of genetic diversity of common bean in Zimbabwe is high, but some farmers grow local landraces, which are low yielding, resulting in low productivity at smallholder farmer level. The average demand for beans is estimated at 180,000 tons per annum to satisfy an average domestic consumption of 12 kg per capita per annum. This demand is likely to go up as there are initiatives involving NGOs and government agencies through the Ministry of Health and Child Welfare and Food and Nutrition Council to promote production and consumption of common bean. Currently the bean seed demand is estimated at 3,800 tons, and this is also likely to go up with the demand to produce more beans for consumption and markets.

### Trends in bean production

In Zimbabwe, crop assessment reports are mainly focused on food security crops such as maize and wheat. Funding for assessments is under FAO. Common bean is grown under different production systems, rainfed and irrigated. Most of the irrigated crop and crops in gardens are never reported but estimated to occupy 30,000 ha annually. Common bean in gardens had been reported under the umbrella term horticultural crop and it is difficult to get accurate area under production. In general, the area under bean production has been variable over the years, with some downward trends in recent years. The decline in production can be attributed to shortage of seed in the market, poor marketing of the bean varieties and dry spells (drought) which have significantly affected bean production for the past years. Although production statistics for common bean are scanty, it is estimated that approximately 120,000 ha are planted to a bean crop every year and the average yield is 0.5 t $ha^{-1}$, which translates into a total production of 60,000 tons.

# Research and development

## Variety development

Both public and private breeding programs contribute to bean research in Zimbabwe. Universities through student projects also contribute to the research work in Zimbabwe. The national breeding program under the auspices of the Crop Breeding Institute (CBI) is housed at DR&SS in Harare and private seed companies are also in Harare while their research sites are all over bean growing areas. Seed Co, PANNAR Seeds, Agriseeds, Sandbrite and Progene Seeds are actively involved in either breeding or marketing of the bean products. Zaka Seeds, a community-based company, has also joined hands in popularizing improved new varieties since 2011.

Bean breeding activities for the national breeding program are focused on developing improved bean varieties that are high yielding (3,000 kg $ha^{-1}$ low-veld winter production and 2,400 kg $ha^{-1}$ for summer high- and middle-velds production) and have acceptable grain market classes (large seeded sugar, red and calima in descending order and small white). In addition, the varieties should have good levels of resistance to important biotic and abiotic constraints. In particular the biotic constraints in focus are diseases (angular leaf spot and common bacterial blight) and pests (storage pest *Zabrotes subfasciatus*; and field pest bean stem maggot). Among the abiotic constraints the focus is on tolerance to low soil fertility and resistance to drought and heat. Another attribute that is under consideration in the breeding program is nutrition quality, particularly for high Fe and Zn content in the grain.

Alongside the variety development activities, the bean team in Zimbabwe is also developing integrated soil fertility management (ISFM) as well as integrated pests and diseases management (IPDM) practices.

To date, a total of 8 new bean varieties have been introduced in the market over the past few years (Table 1). These varieties were released by different institutions: Cardinal (calima) and Speckled Ice (sugar) from Progene Seeds; NUA45 (calima) and Gloria (sugar) + Iris (carioca) from the CBI; Bounty (sugar) from Seed Co; and other varieties from PANNAR which include PAN127 and PAN148. The other seed companies, viz, Sandbrite Seeds, Agriseeds, ARDA seeds, SIRDC, NTS and Zaka Seeds are marketing CBI varieties. These companies are involved in production of certified and standard grade seed in different bean growing regions.

Farmers and consumers prefer bean varieties based on seed size, color, taste and cooking time. The commonly preferred varieties are the large-seeded, red and the sugar type (cream with red speckles). Most of the released bean varieties meet these requirements.

## Production constraints

The list of constraints that impede the bean value chain in Zimbabwe are listed below:

- Drought – farmers have no resources for supplementary irrigation
- Lack of access to seed
- Lack of appropriate postharvest handling and utilization techniques (value addition)
- Poor diffusion of information on available bean technologies, including varieties
- Lack of credit facilities to facilitate business initiatives
- Lack of market information
- High cost of production
- Prevalence of diseases under rainfed conditions

**Table 1. Common bean varieties in Zimbabwe.**

| Variety | Original code | Source | Year of release | Responsible institution | Optimal production altitude range (m amsl) (rainfed) | Time to maturity (days) | Grain yield (t $ha^{-1}$) | Special attributes |
|---|---|---|---|---|---|---|---|---|
| Iris | MCM5001 | CIAT | 1998 | DR&SS | 600–1200 | 90 | 3.5 | Drought tolerant, early maturing, carioca |
| Cardinal | CIM9314-17 | CIAT | 2007 | Progene Seeds | 600–1200 | 95 | 4 | High yielding, wide adaptation, calima |
| Speckled Ice | SUG131 | CIAT | 2007 | Progene Seeds | 600–1200 | 94 | 3.5 | Wide adaptation, sugar market class |
| NUA45 | NUA45 | CIAT | 2010 | DR&SS | 600–1200 | 90 | 2.4 | Good taste, rich in Fe and Zn, high yielding, quick to cook, calima |
| Gloria | PC655-SS3 | ARC-GCI | 2010 | DR&SS | 600–1200 | 93 | 2.4 | High yielding, attractive seed color |
| Bounty | | Seed Co | | Seed Co | 600–1200 | 96 | 2.0 | High yielding, sugar market class |
| PAN148 | | PANNAR | | PANNAR | 600–1200 | 90 | 2.1 | Widely adapted, resistant to bean common mosaic virus (BCMV), sugar market class |
| PAN127 | | PANNAR | | PANNAR | 600–1200 | 94 | 1.6 | Moderately tolerant to rust and resistant to BCMV, sugar market class |

## Planned Phase 2 activities

In Zimbabwe the planned activities will be implemented by engaging the key stakeholders in the bean value chain, through strategic planning to resolve the critical constraints and unlock the available opportunities. This requires various partners to put their ideas together and commit resources to resolve the constraints, and pave a way for a successful bean value chain. The processes will also require capacity building while mainstreaming culture and gender into project work plans.

Access to sufficient quantities of bean seed of preferred improved varieties as well as promotion of other eco-efficient non-variety bean production technologies will be one of the priority areas. Knowledge empowerment for farmers on bean production technologies will play a big role in production and productivity increase. This will be achieved through training of extension personnel and lead farmers. Participatory variety selection (PVS) will be implemented to identify farmer and consumer preferred varieties and traits. Field days and demonstrations will be conducted to create awareness and demand for the newly released improved varieties and associated bean production technologies.

## Expected outcomes

Phase 2 of the project aims at ensuring national self-sufficiency in bean and surplus for sale. This is expected to translate into improved household food and nutrition security and more income from bean sales at local as well as regional markets.

# Agroecological zones

The bean crop is grown across many parts of Zimbabwe under rainfall or irrigation conditions. The production environments are categorized into agroecologies (high, medium and low-velds) according to altitude and rainfall, as described in the Africa Bean Atlas (which is under revision) (Fig. 1). In the low-veld zone (below 1000 m amsl), beans are not cultivated during the rainy season, because the night temperatures are too high for pollen to remain viable, and instead these areas produce beans during the postrainy season, under residual moisture or irrigation.

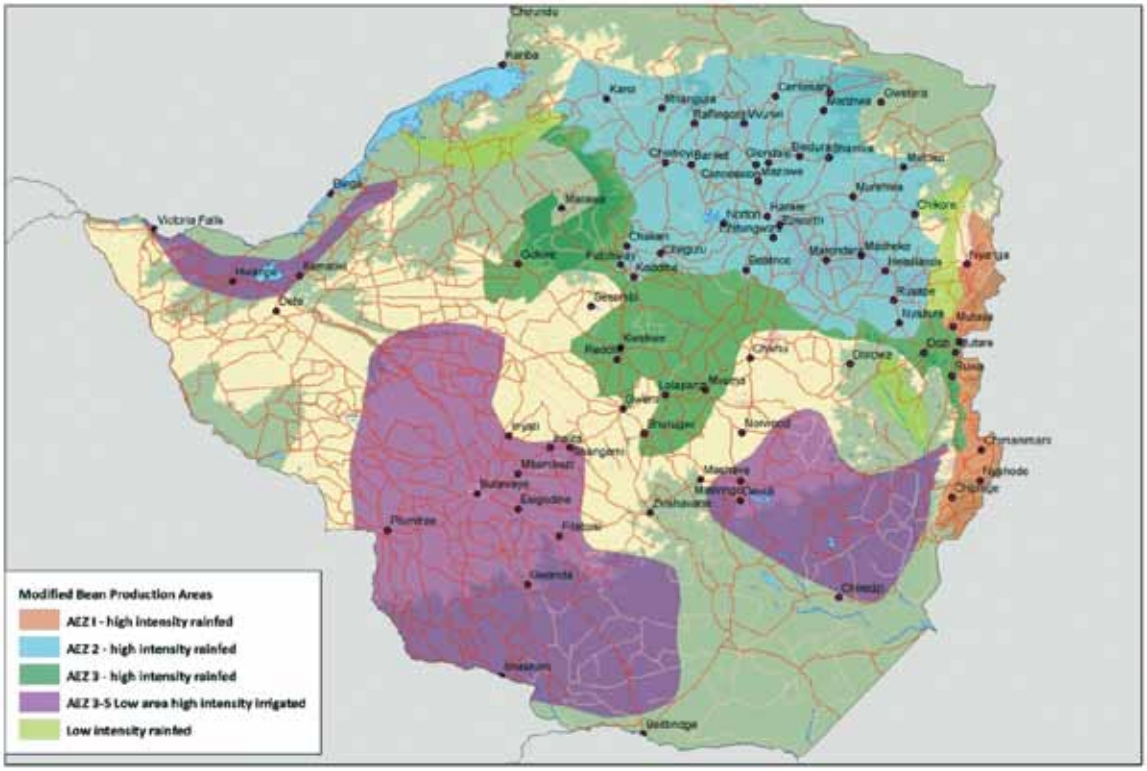


***Figure 1. A map showing the revised bean production zones of Zimbabwe.***

## Seed systems

In Zimbabwe, there are some private seed companies that develop their own bean varieties (Seed Co and PANNAR), which complement the government's effort through the CBI to make available improved bean varieties to the farming community. As such seed availability is tackled from various fronts. The seed companies, CBI, extension agents (government, NGOs and farmer unions) and marketing institutions need to work together to increase the quantity of seed in the market. The whole chain of seed production needs to be strengthened (breeder seed, foundation seed, certified/standard grade seed).

### Opportunities

- Willingness of partners (NGOs and the private sector) to try small seed pack strategy
- Availability of private seed companies for production of breeder, foundation and certified seed
- Willingness of NARS breeder to work with the private sector to produce more breeder seed
- Existence of farmer groups/associations, for example, Zimbabwe Farmers Union (ZFU), Zaka Seeds (community-based company)
- Farmers are willing to experiment with new products
- Demand for seed is high
- Existence of extension agencies country wide (both NGOs and government)

### Constraints

- Unavailability of seed of improved varieties
- High input costs
- Lack of capacity to produce sufficient breeder seed to meet the demand
- Poor diffusion of information on available bean technologies, including seeds
- Poor infrastructure for seed production
- Lack of credit facilities to facilitate business initiatives (massive seed production)
- Lack of seed market information
- High cost of seed production
- Poor product packaging (no small packs)
- Prevalence of diseases under rainfed conditions affect seed quality
- Aging equipment and facilities at research sites and other seed production sites

### Strategic partnerships and roles

Partners will be involved to enhance organization of proper target groups in the targeted areas and to popularize improved high-yielding bean varieties with acceptable end-user traits and associated improved bean production technologies. The key partners and their roles are described in Table 2.

**Table 2. Key partners in the bean value chain and their roles.**

| Partner | Role |
|---|---|
| Department of Agricultural Research & Special Services and universities | Variety development, evaluation and release; production of breeder and foundation seed; develop integrated crop management technologies |
| Seed companies – Seed Co, PANNAR Agriseeds, Sandbrite, Progene Seeds, ARDA Seeds, SIRDC, NTS and Zaka Seeds | Facilitate processing and commercialization of bean seed and products |
| Farmers' organization/associations (Zimbabwe Farmers Union) | Capacitate farmers formation of associations for collective production and marketing; seed systems support; help collaborating NGOs and CBOs with quality seed production/monitoring |
| NGOs | Provision of guidance in crop production technologies and associated packages |
| CGIAR center – CIAT | Provide improved bean germplasm/breeding populations; capacity building through training; research on effective methods for technology dissemination |
| Farmers | End-users of technologies in terms of high-yielding varieties and management practices |
| Department of Extension (Agritex) | Support to farmer field schools to impart knowledge and skills for increased production on farm |

## Seed production plan

The total bean area is estimated at 120,000 ha, of which 40% or 48,000 ha is targeted. At a seed rate of 80 kg $ha^{-1}$, this will require 3840 tons. The goal yield is 1 t $ha^{-1}$, for a national production of 120,000 tons. The bean seed roadmap in Table 3 is based on these estimates.

**Table 3. Bean seed production system plan to reach 40% adoption by 2015.**

| | | | | | | | Breeder seed (2013) | | Foundation seed (2014) | | Certified seed (2015) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agroecology | Area covered (%) | Variety | Seed rate (kg $ha^{-1}$) | Yield (kg $ha^{-1}$) | Area (ha) (100%) | Target area (ha) (40%) | Area (ha) | Production (t) | Area (ha) | Production (t) | Area (ha) | Production (t) |
| High- and low-veld | 100 | | 80 | 1000 | 120000 | 48000 | 25 | 25 | 307 | 307 | 3840 | 3840 |
| | 28 | Gloria | 80 | 1000 | 33600 | 13440 | 7 | 7 | 86 | 86 | 1075 | 1075 |
| | 27 | NUA 45 | 80 | 1000 | 32400 | 12960 | 7 | 7 | 83 | 83 | 1037 | 1037 |
| | 20 | VTTT 925/9/2/1 | 80 | 1000 | 24000 | 9600 | 5 | 5 | 61 | 61 | 768 | 768 |
| | 20 | MG 38 | 80 | 1000 | 24000 | 9600 | 5 | 5 | 61 | 61 | 768 | 768 |
| | 5 | Iris | 80 | 1000 | 6000 | 2400 | 1 | 1 | 15 | 15 | 192 | 192 |