Photo: CRS-Burundi

Strengthening farmer-saved bean seed through hermetic storage in Burundi

Introduction

Bean (*Phaseolus vulgaris*) is the most important crop in Burundi, cultivated on over 400,000 hectares of land. Eighty percent of beans are produced by farmers holding parcels of less than two acres and beans are grown in association with maize, bananas, cassava and sweet potato. Beans provide as much as 50–60% of dietary protein in Burundi and the annual per capita consumption is about 60 kg, the highest in Africa. Beans also supply B-vitamins, calcium, iron, phosphorous, potassium and zinc, which are essential for human growth, health and cognitive development. Bean residues are used as mulch in coffee and banana production, and are also used as animal feed during the dry season (Grisley and Mwesigwa 1991; Birachi et al. 2011).

In Kirundo Province, 96% of farmers ranked bean as one of their three most important crops followed by banana at 45%. In spite of its importance, Burundi's bean production has declined almost 20% from 250,000 metric tons (MT) in 2003 to 203,000 MT in 2009, and supply is not meeting domestic demand. Farmers prefer the semi-climbing varieties to both climbing and bush varieties in northern Burundi. Most farmers, especially the less well-off, occasionally purchase seed from the open market (David and Sperling 1999). The quality of the seed from the market is variable, where seed from local sources tends to be better than seed from distant markets (CRS 2011).

Until recently, farmers have had little access to improved varieties of bean and then only to bush types. Farmers cultivate beans three times a year: in the first and second rainy season in the uplands, and in the dry season in the lowlands. With support from CIAT (International Center for Tropical Agriculture), ECABREN (East and Central African Bean Research Network) and PABRA (Pan African Bean Research Alliance), ISABU (Institut de Sciences Agronomiques du Burundi) has initiated an ambitious program to identify and develop a range of new varieties, increase seed of these varieties and ensure that farmers have access to them in a timely manner. It is important that this identification of new varieties by farmers be combined with support to ensure that they can sustain access to preferred varieties, either through purchase or by managing their own seed. Seed management – particularly selection, drying, conditioning, and storage – is critical for seed viability and ultimately yield (CRS 2011).

A collection of hermetically sealed seed storage containers from the project including plastic seed containers and modified small Batwa clay pots.

Materials & Methods

The set of activities discussed in this case study were designed and executed under an OFDA grant aimed specifically at promoting on-farm hermetic storage technology. This project was complemented by a USAID/ Food for Peace project that assisted farmers to evaluate 22 new bean varieties (eight climbing, six semi-climbing and eight bush) in the same geographic zone where CRS in collaboration with ISABU designed a "mother and baby" trial with 63 mother locations and 915 participating farmers (average of 15 farmers per "mother" location).

Also in collaboration with ISABU, CRS implemented the OFDA-funded On-Farm Bean Seed Storage project from November 2011 to March 2013 in four provinces of Burundi (Kirundu, Kayanza, Ngozi and Muyinga). The focus of this program was training on bean seed production, conditioning and storage while promoting farmer access to hermetic seed containers.

These storage containers included PICS sacks, GrainPro Superbags (both 100 kg capacity), 20 liter vegetable oil containers, 1.5 liter mineral water bottles and modified small Batwa clay pots. PICS sacks involve a polyethylene bag and seal which is then surrounded by another identical bag and sealed. The double-bagged crop is then held within a third, woven polypropylene bag. The GrainPro Superbag is made of multilayer polyethylene (PE), sealed by a two-track zipper using a zipper slider, and is 73 grams per square meter. Plastic bottles and oil containers were available locally but had competition for their use. Bottles and oil containers have multiple other – and in many cases more valuable – uses than seed storage. Traditional clay plots were widely available but don't seal well or keep out moisture.

Hermetic storage using a wide range of plastic containers and sacks is effective in bean seed storage without insecticide.

Supporting farmers with hermetic seed storage is a catalyst for strengthening farmer seed management.

Hermetic storage is a great link to farmer participatory varietal evaluation and small packet promotion.

Results & Discussion

Through these efforts a total of 515 kg of seed of 22 new bean varieties were supplied to farmers in small packets (0.5 kg/packet). A total of 20,660 farmers (18,880 women) were trained in seed production, conditioning and storage and were provided with different hermetic seed storage containers.

There was widespread acceptance and adoption of the range of hermetic storage containers at the close of the project apart from Batwa clay pots which farmers found difficult to hermetically seal. A follow up visit revealed that farmers have started to use hermetic storage (primarily the recycled plastic containers) for other crop seed, including pea and maize.

Data from the project baseline and the project evaluation suggests that project participants were able to significantly increase the percentage of seed from their own saved seed sources, from 55% to 80%.

There was also a reduction in seed loss from 20% to 8% (comparing the baseline to the final evaluation) and a reduction in the use of insecticides in storage from 49% to 4%.

The 43 farmers who sold seed as part of the project increased the quantity of seed sold significantly and the selling price slightly (Figure 1). The increase in the quantity of seed sold is attributed to better selection, conditioning and storage, all of which resulted in less loss of seed (more to sell) and better quality seed (CRS and ISABU 2011).

Farmers storing seed for their own use found that the 100 kg PICS sacks and GrainPro Superbags were too large. However, these larger sacks are appropriate for storage of seed for sale as well as for grain. Seed sale prices increased from $0.40/kg to $0.54/kg for Season A and from $0.40/kg to $0.45/kg for Season B. It is thought that these increases were due to consumer interest in and demand for new varieties.

With only a short and variable dry season between Season A and Season B (c. June to October), seed drying can be a problem. The importance of drying seed before hermetic storage was stressed during training sessions. However, in spite of possessing two seed moisture meters, the project failed to monitor seed moisture across the three seasons at container closure and opening. Change in varietal purity under farmer seed management was also not monitored, so it is not known whether farmers are maintaining varietal purity and if not, why not (accidental or purposeful mixing) (CRS and ISABU 2011; Ntahontuye 2011).

Conclusions & Recommendations

The Hermetic Bean Storage pilot demonstrated the benefit of improved storage on the quantity of seed stored for a farmer's own use and for sale. Adoption of hermetic storage was 100% with evidence of spread to other crops. The supply chain for vegetable oil containers and mineral water bottles already exists and the price is affordable. However, both the PICS sacks and GrainPro Superbags were imported by the project and are therefore not currently available commercially. In collaboration with Purdue University and GrainPro, effort is required to establish this supply chain to meet the demand of seed producers/sellers and also for on-farm bean grain storage.

As hermetic storage is applied to other crops, increased attention needs to be paid to adequate seed drying before storage while promoting new varieties. This can be achieved by working to strengthen the commercial seed retail supply chain and supporting small packet sales for farmer variety evaluation. If funds are available, partial value coupons can be a powerful marketing tool and incentive. This should be carried out in conjunction with promoting hermetic storage and better information on new varieties, where labeling storage containers with variety names can facilitate the monitoring and spread of new varieties.

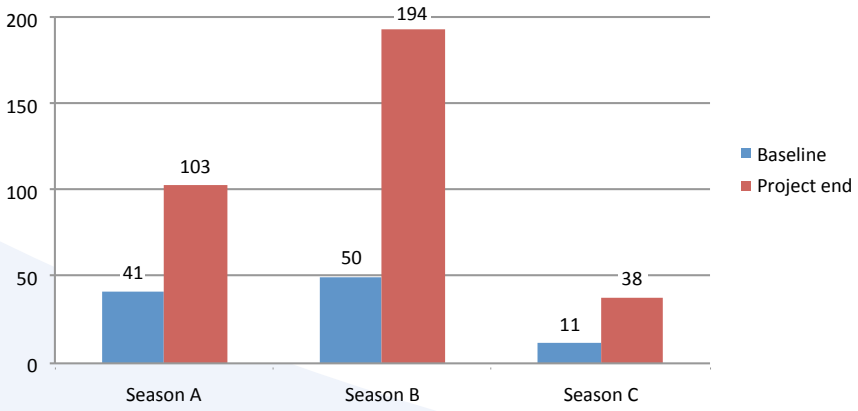

Figure 1: Kg of seed sold by farmers participating in project 2010–2011

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