

Participatory approach making bean seed accessible to millions of small holders in Burundi

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Common bean (*Phaseolus vulgaris* L.) is an important crop for food and nutrition, cash, and agro-ecosystem improvement in many countries in eastern, central, and southern Africa [2]. Burundi is a landlocked country; whose economy depends mainly on agriculture, which contributes around 40% of the GDP, employs 84% of the labor force, and contributes to over 95% of the food supply [1]. Common bean is a major food and cash crop in Burundi. It is often cultivated by small-scale farmers, with 86% of the households farming less than 0.5ha [3] in association with other crops or as a sole crop. Common bean occupies 599,139 hectares (40%) of land [4]. The crop is vital for the nutritional security of Burundian households, providing 50% of proteins and approximately 20% of calories in the diet [5]. The current average bean consumption is about 30 kg per person per year. However, Burundi also has a high prevalence of micro-nutrient deficiencies - about 58% of children under five years are stunted, 56% are anemic, 35% are underweight, and 7% are wasted. In addition, Zinc deficiency affects about 47% of the population [6]

Bean seed systems in Burundi is predominantly informal. The major challenge for Burundian farmers is to access quality seeds of climate resilient bean varieties in sufficient quantities adapted to various agro-ecological conditions [7]. The Ministry of Agriculture, Environment and Animal Husbandry (MINEGARIE) [8] indicated the low use of good quality seeds is due to low availability of high performing varieties that meet farmers and consumer demands and the failure of the seed production chain, insufficient information on the importance of good quality seeds and low purchasing power of farmers. An effective seed supply system is necessary to make climatic adaptable quality seeds available to farmers at the right time and low cost.

The Alliance of Bioversity International and International Center for Tropical Agriculture through its bean research program in Africa;- The Pan-Africa Bean Research Alliance (PABRA), collaborated with the Institut des Sciences Agronomiques du Burundi (ISABU), to deploy new participatory approach in seed system to address the above challenges. The deployment was financially supported by the Swiss Agency for Development and Cooperation (SDC), with complementary funding from Global Affairs Canada (GAC), Government of Burundi and various development partners. The efforts of building sustainable bean seed systems focused on the following areas: -

- (1) Releasing bean varieties that farmer/ consumer demanded and climate resilient
- (2) Participatory prioritization of these varieties by bean value chain actors
- (3) Demand creation on the benefit of using new varieties and complementary climate smart production techniques
- (4) Increasing early generation of prioritized varieties
- (5) Aligning and synchronizing seed and grain production of prioritized varieties
- (6) Capacity building of local seed entrepreneurs and grain producer farmers
- (7) Integrating various seed approaches and making bean seed accessible and affordable to the poor majority.
- (8) Robust monitoring, evaluation and learning to facilitate sharing of lessons and influencing other investments in the value chain. The implementation has been one of the major success stories in the country and to their collaborators.

PABRA model recognizes the importance of participatory approaches from bean varietal development to dissemination. Bean key actors are closely involved in every stage, i.e., screening, release, promotion, seed

dissemination, and grain production. This participation is not just for the sake of ensuring participatory approaches. However, it makes the difference between adaptable and non-adaptable technologies in the technology development and adoption cycle [9]. The approach helps to avoid duplicating efforts in the same area. On the other hand, it intensifies the action, reaching many farmers at a lower cost.

Presented below are the impacts resulting from collaborative efforts undertaken within the seed systems through several innovations on seed production and delivery led by PABRA and ISABU in partnership with the development organizations and private sectors to improve the situation.

Data **used in this report**, were collected from the total of 75 seed producers from 15 provinces using Open Data Kit (ODK) and ONA applications by the ISABU and the Alliance teams from 2015 to 2020. Analysis was done through Microsoft Excel while Spatial analysis and map production was performed on ESRI Arc Map, version 10.5.

Selecting a suitable seed variety is an important decision to small-holder farmers. Considering that most farmers produce grain responding to market demands therefore, providing an extensive choice of improved varieties is vital. PABRA recognizes the importance of implementing demand-led bean research where key actors such as the bean grain traders (off-takers) involvement is critical, and their bean-related issues becomes a focus. **Therefore, between 2015-2020 various multi-stakeholder platform meetings were held in Burundi. The meetings were attended by the private seed entrepreneurs, farmer cooperatives, NGOs, and off-takers from several provinces. This helped ISABU bean researchers to determine the suitable material preferred by the market.** Once the desired variety was identified, germplasms that possess the desired traits were shipped to Burundi from Uganda (Kawanda, PABRA Germplasm Resource Centre) because the Burundi hybridization program was underdeveloped. Other options for accessing materials **were** from the PABRA member countries under its networks, such as ECABREN, where Burundi is a member. This process was followed by participatory line evaluation across various agro-ecologies, where key actors selected the best performing line(s) that best fit their environment and market. The processes were completed by releasing procedures by the National Office of Control and Seed Certification (ONCCS). The newly released varieties were promoted in partnerships with farmer cooperatives, individual seed entrepreneurs, and NGOs to help quick diffusion and dissemination. As a result, the following **outcomes** were attained.

1. Productivity increase and old variety replacement

Given the critical role of improved varieties **on** increasing quantity and quality of the grain, releasing nutritious bean varieties that can withstand threats exacerbated by the effects of climate change and increasing productivity under the shrinking land was crucial. This observation prompted the PABRA breeders to **bred** for multiple constraints resistance varieties that could withstand climatic variation and **were** high yielders. Based on the seed system data collected from 2015 to 2020, a total of 24 (16 climbers' type, eight bio-fortified, and eight climate-smart) varieties have been released since 2015. The climber type yield is three times higher than the bush. Climate-smart varieties released are tolerant to drought, low fertility soils, and diseases. The early maturing and higher-yielding HIB varieties have seen bean productivity rise to 1.8 tons/ ha against an average of 0.75 tons/ ha in the region. (source: <https://hdl.handle.net/10568/109120>; <https://hdl.handle.net/10568/113988>).

i. Improved variety turnover.

Among the 24 newly released, 12 varieties are already in the farmers' hands. This variety turnover was made possible through collaborations among research, farmer cooperatives, individual seed entrepreneurs, and NGOs that helped in variety promotion and dissemination across countries using demonstration plots, bean platforms, and other channels. Seed System data analyzed since the project's inception in 2015 to 2020 shows that old varieties were replaced by new varieties from 22% in 2015 to 91% in 2020. See below figure 2.

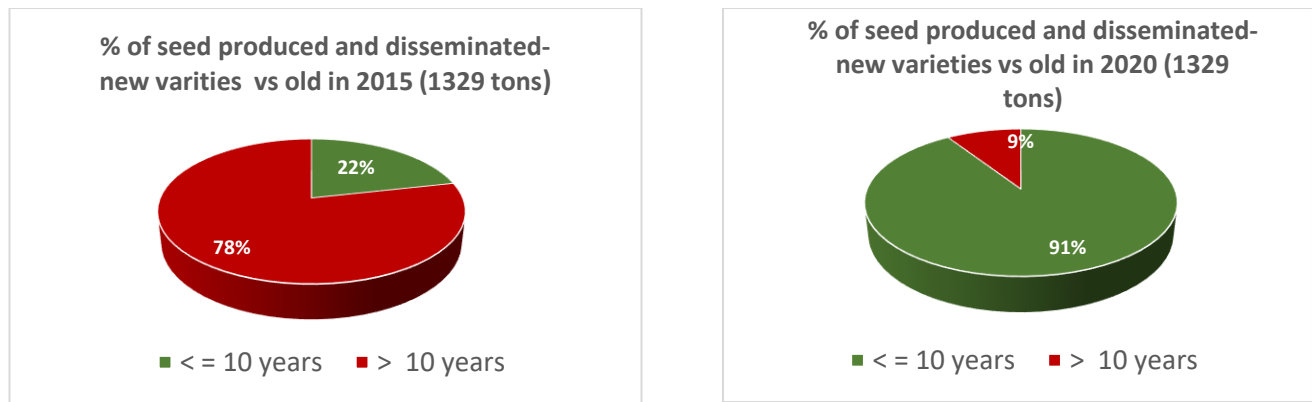


Figure 2: Graphs showing seed production percentage of new varieties (less than ten years) in 2015 (left) vs. 2020 (right)

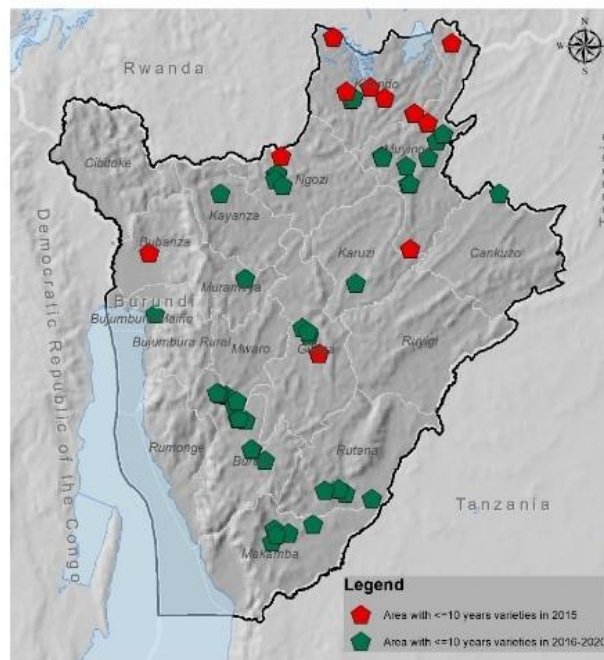


Figure 3 (left): Map showing area under new bean varieties (less than years) in 2015 vs. 2020

2. Increased access to **basic**, certified and **quality declared** seed varieties through public and private partnership

As partners work together, the definition of their responsibilities becomes more transparent and more complementary [10]; therefore, recognizing that seed demands cannot be met by individual effort but rather by actors along the bean value chain. In Burundi, 100% of breeder and pre-basic bean seeds are produced by ISABU which supply the seed to competent decentralized individual seed entrepreneurs who produce basic seed. Subsequently, basic seed is supplied to farmers' associations, individual seed producers or cooperatives (figure 4) who multiply them into certified and quality declared seeds. Certified and quality declared seed is later sold to farmers producing bean grains for consumption or sale. Since 2015, ISABU and The Alliance have dedicated its efforts on capacity building to seed producers on seed production, storage, and marketing. These engagements have helped seed producers to improve their seed quality and expand their seed businesses, leading to seed quantity increase and dissemination.

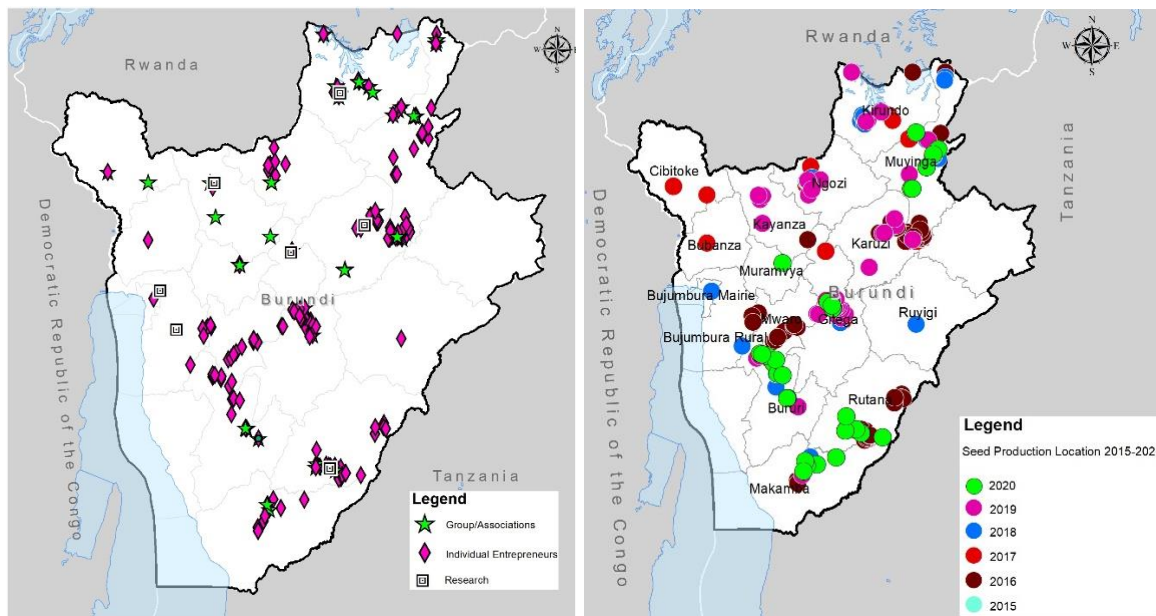


Figure 4: Map (left) showing the distribution of seed producer category. Map (right) showing Location of seed production year 2015-2020.

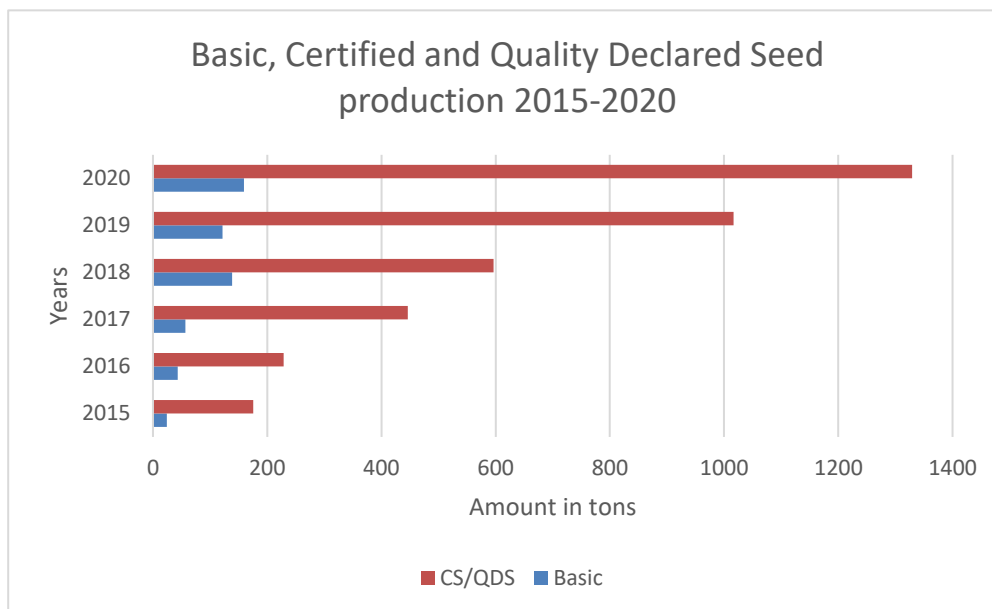


Figure 5: Graph showing trend of seed quantities from 2015 to 2020

New improved bean varieties must be accessible to communities before they can be adopted [5]. Most farmers in Burundi are poor and own small plots with low seed access due to limited purchasing power. Introducing affordable seed packages was therefore very crucial. Thus, PABRA introduced a seed delivery model of affordable & small packs sizes of 1kg, 2kg, 5kg, and 10kgs to seed entrepreneurs to improve seed access to smallholder farmers. Since then, the number of farmers accessing seed has increased from 17,558 in 2015 to 1,329,000 in 2020 (60% women). Nevertheless, time between release and use has decreased from 5 to 3 years. This implies that now farmers are accessing new improved varieties much faster than it was five years ago.

3. Established business linkages among bean seed producers with other development partners

The common bean platform meetings brought seed producers together, therefore business relationships were also developed. With Geographical Information System (GIS) aid, seed producers with their seed production quantities were mapped seasonally and yearly. Similarly, seed movement was tracked, primarily when the identified bean seed producers conducted the business. It was noted that since 2017, there had been seed exchange among

producers, which was validated through spatial analysis (figure 5). The study revealed that the closest seed business was conducted within 0.065 km while the furthest was 74 kms. This observation validated the seed producer linkage established by ISABU and PABRA; private seed producers see opportunities to invest in beans.

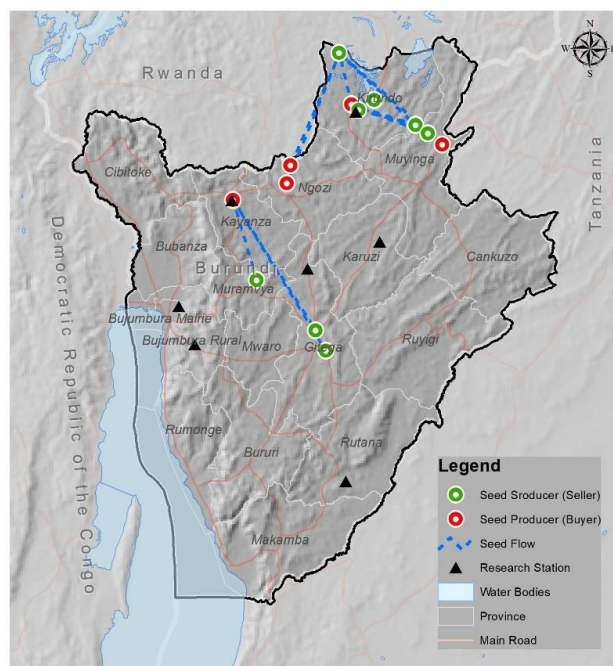


Figure 5: Map of Burundi showing bean seed business activities among seed producers since 2017-2020

The participatory approach combined with other seed delivery innovations deployed within the seed system since 2015 has helped Burundi speed up getting seed in the hands of farmers, linking seed and non-seed partners, and making seed easily accessible and affordable. The accessed nutritious, climate-smart bean seed will help improve nutritional status, increase household income, and generate government revenues.

Next steps

Though good progress in accessing new varieties has made, several areas gaps exist particularly aligning seed production to grain production and grain demand to sustain the momentum. The use of [bean corridor](#) offers a platform for better coordination between seed and grain production. The approach will facilitate demand led breeding linked to seed systems. This facilitate the dispersed smallholder producers who will be integrated into bean value chains which in turn will catalyze demand for quality seed of improved varieties to respond to bean trade demand. The platform also facilitates better targeting of provision of inputs (e.g. fertilizers, pesticides, mechanization, financial) and outputs services through digitalization services.

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