Climbing Bean with High Yield and N Fixation

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Summary

Climbing bean varieties offer higher yields but require more intensive cultivation compared to bush types. Improved varieties of climbing bean with high yield potential, resistance to pests and diseases, and tolerance to abiotic stresses are now available in Eastern and Southern Africa. Breeding and selection for higher biological nitrogen fixation in climbing bean has served not only to cut costs for farmers but also makes it possible to grow the crop in nitrogen depleted soils. Climbing bean cultivation by small-scale farmers in Africa is highly effective in alleviating hunger and malnutrition, and enhancing incomes.

Technical Description

Climbing beans, also called pole beans, are characterized by long, indeterminate growing vines that reach up to 4 or more meters in height and require support from stakes or trellises. Conventional breeding approaches resulted in a number of climbing bean varieties for different agroecosystems across Sub-Saharan Africa, including elite lines with higher nitrogen fixing ability and landraces adapted to local conditions. Traits such as bean productivity, nodulation efficacy and resistance to drought, diseases and insect pests are the focus of this varietal improvement, and HIB varieties are also available. Climbing beans are capable of giving two to four times the bean harvest of bush varieties since they develop a vertical canopy and have a longer harvest period.

Uses

Climbing beans offer the best option for small-scale farmers where landholdings are diminishing and degrading, and available varieties have been adapted to the soil and weather conditions in diverse production zones across Sub-Saharan Africa. For instance, targeted breeding of early maturing and heat tolerant lines has enabled expansion of climbing beans from its traditional high altitude to medium- and low-altitude areas with semi-arid climates. Their high nutritional value makes climbing bean varieties well-suited for processing into flour or other products, such as pre-cooked and canned beans, which can be retailed on local and international markets.

Composition

A large diversity of improved climbing bean varieties is available for multiplication by farmers, community-based seed producers and private seed companies. These varieties

include Mid-Altitude Climbers (MAC) 13, 34 and 64 in Kenya, NABE 12 and NABE 26C/28C in Uganda, MAC 44 and RWV 1129 in Tanzania, and Gasillida, RWV 3317 and RWV 3006 in Rwanda. Improved varieties of climbing beans are ready for harvest within a period of 95-120 days, and have excellent palatability and a high starch content.

Means of application

Suitable climbing bean varieties and accompanying crop and soil management practices form a technology bundle that must be tailored in accordance with agro-ecological conditions and socio-economic contexts. Climbing beans must be supported by stakes or trellises. Furthermore, they are best cultivated as a monocrop but it can be intercropped with maize, banana, roots and tubers, sorghum or millet. Planting is usually done on hills or ridges receiving organic inputs, particularly in clay soils or where the water table is high. Plant densities are determined by the particular trellising system and degree of mechanization, with the spacing between rows for a monocrop typically at 75-100 cm. To achieve the full yield potential of climbing beans and maintain soil fertility on farmlands, there is need for seed inoculation with rhizobia, timely planting, fertilization, strong and tall staking and proper weeding.

Agroecologies	Humid forest, Highlands, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Zimbabwe, Rwanda, Burundi, Democratic Republic of the Congo, Tanzania, Zambia, Ivory Coast, Uganda, Kenya, Benin, Malawi, South Sudan.
Available in	Zimbabwe, Rwanda, Burundi, Democratic Republic of the Congo, Tanzania, Zambia, Ivory Coast, Uganda, Kenya, Benin, Malawi, South Sudan.
Solution Forms	Genetics.
Solution Applications	Improved variety.
Agricultural Commodities	Common bean.
Target Beneficiaries	Agro-dealers, Small-scale farmers, Women, Commercial farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

The following actions need to be undertaken for entering into production of climbing beans: 1) Promote the availability of improved climbing beans and their benefits with regard to yield, climate resilience and return on investment, 2) Transfer elite varieties to commercial and community-based seed multipliers as a new product line, 3) Connect producers of climbing beans with buyers and food processors to create wider market opportunity, and 4) Provide financial support to farmers so they can make necessary and timely investments into quality seed, fertilizer inputs and staking. For commercial producers, the availability of netting streamlines trellising operations.

Production Costs

The development of new climbing bean varieties carries substantial costs for selective breeding and field testing which are typically carried by the public sector and donors. The transfer of improved climbing beans from institutions to private seed companies and farmers may require licensing agreements. Multiplication of climbing bean varieties is easy and inexpensive, and since they are self-pollinated farmers can save the best grains as planting material for the next season. Growing climbing bean is labor-intensive since they require staking and because of their large biomass production, climbing beans also require more nutrient inputs.

Customer Segmentation

Scaling the production of climbing bean serves a large customer base, including national programs, small-scale and commercial producers, private seed companies and food processors.

Potential Profitability

Food security and incomes of farmers are significantly increased when they grow climbing beans, as has been demonstrated in Rwanda where for each additional kilogram of planted climbing bean there was an increase of 2.8% in bean consumption and 0.9% in total food intake. Households that grow climbing bean increase food security and decrease the likelihood of financial hardship.

Licensing Requirements

Varieties of climbing bean are sometimes marketed by private seed companies or national programs under a commercial license. However, the diffusion of the varieties happens through various integrated seed systems approaches including informal seed systems and community based seed production.

Innovation as Public Good

Climbing bean varieties with high yield potential and nitrogen fixing ability have been developed as a Regional Public Good by ABC through the Pan African Bean Research Alliance (PABRA) in collaboration with national partners, who share the responsibility for delivering the technology to farmers via local and regional initiatives for agricultural transformation.

Solution Images





Institutions

Alliance

Bioversity International

CIAT

International Center for Tropical Agriculture

Accompanying Solutions

Low-Cost Staking for Climbing Beans

Seed Inoculation with Rhizobia

Seed dressing of Seed with Fungicide and Insecticide