TROPICAL LEGUMES

Accelerated breeding and seed delivery of critical legume crops in Africa and Asia

ETHIOPIA FACTSHEET

The Tropical Legumes projects were a series of initiatives that helped develop and distribute high-yielding, climate-resilient food legume varieties to millions of poor farmers across Africa and Asia. Implemented over a 12-year period with US$67 million in funding from the Bill & Melinda Gates Foundation, the projects were led by three international CGIAR research organizations – the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Center for Tropical Agriculture (CIAT), and the International Institute of Tropical Agriculture (IITA) – and implemented by national and regional partners.

In Ethiopia, the Tropical Legumes projects partnered with the Ethiopian Institute of Agricultural Research and collaborated with several other organizations to exchange knowledge and resources, including the Integrated Seed Sector Development program, the International Center for Agricultural Research in the Dry Areas, and the United States Agency for International Development.

CONTEXT

Many Ethiopian households rely on chickpea and common bean for income and food. Access to more resilient varieties would help Ethiopian farmers to adapt and improve their production.

In 2018, Ethiopia produced 520,000 tons of chickpea grain and 610,000 tons of common bean grain.[a]

APPROACH

STRENGTHENING BREEDING CAPACITY

The Tropical Legumes projects, together with partners, strengthened capacity by bringing in new techniques, training, and equipment to speed up the process of developing improved seed varieties. The projects introduced modernized breeding activities and improved infrastructure, including installing improved irrigation and storage facilities. They also provided training for crop breeders, covering the use of genomic tools and digital technologies. As a result, Ethiopia's chickpea breeding pipeline can now manage **81 crosses per year** – up from **24** in 2007 – accelerating the development of future varieties.[b]

DEVELOPING FARMER-PREFERRED VARIETIES

To identify resilient crop varieties with high yields, the Tropical Legumes projects conducted trials with farmers to select improved varieties that met their needs and those of the wider market. The varieties developed are high yielding, drought tolerant and resistant to a range of pests and diseases; they also have high levels of essential proteins and micronutrients. Improved common bean varieties have been highly successful. Six new varieties have completely replaced the vulnerable 40-year-old varieties that previously dominated the market.[b]

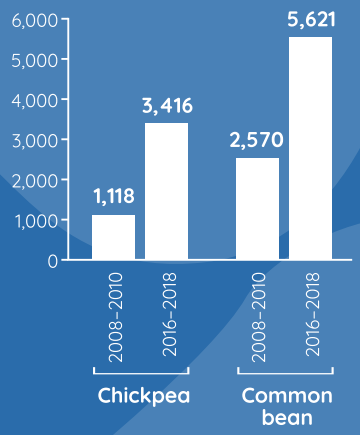
[a] FAOSTAT: www.fao.org/faostat/en/

[b] Tropical Legumes III, Final Narrative: https://tropicallegumeshub.com/rc/tropical-legumes-iii-final-report/

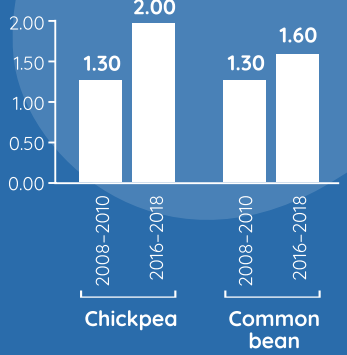
CROP FOCUS:

Chickpea | Common bean

Improved seed produced
(annual average in tons/year)[b]



Productivity
(national annual average in tons/hectare)[a]



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IMPROVING SEED DELIVERY SYSTEMS

To ensure the new varieties reached farmers, the initiatives prioritized efforts to improve seed delivery systems. From 2015 to 2018, **2,800 demonstrations and 56 field days** gave thousands of chickpea farmers an opportunity to witness the improved performance of new varieties.[b] The Tropical Legumes initiatives also helped set up and strengthen platforms involving farmers, seed companies, governmental organizations, and extension workers, and encouraged private and public sector investments in certified quality seed production.

OUTCOMES

Over the lifetime of the Tropical Legumes projects the average annual production of improved chickpea seed tripled, from an average of **1,118 tons/year** (2008–2010) to **3,416 tons/year** (2016–2018). Annual production of improved common bean seed doubled, from an average of **2,570 tons/year** to **5,621 tons/year** over the same period.[b]

The Tropical Legumes initiatives estimate[c] that enhanced seed production has been sufficient for an increasing number of households to plant seed. In 2008–2010, the amount of chickpea seed produced was sufficient for **46,000 households** per year on average, but by 2016–2018 this figure had grown to **142,000 households**. Growth was even higher for common bean, with the annual average increasing from **183,000 households** in 2008–2010 to **401,000 households** in 2016–2018.

Estimates[c] demonstrate the growing economic value of the improved varieties. In 2008–2010 improved seed was sufficient to produce chickpea grain worth an average **US$6 million per year**, increasing to **US$28 million** in 2016–2018. For common bean the equivalent figures were **US$29 million** in 2008–2010, rising to **US$79 million** in 2016–2018.

Alongside other initiatives, these achievements contributed to national productivity gains. Ethiopia's annual chickpea productivity increased from an average of **1.3 tons per hectare** in 2008–2010 to **2.0 tons per hectare** in 2016–2018, and common bean productivity rose over this same period – from an average of **1.3 tons per hectare** in 2008–2010 to **1.6 tons per hectare** on average in 2016–2018.[a]

Specific efforts were made to target women farmers. In Adaa District, for instance, the projects combined the delivery of new chickpea varieties with a training program that included production techniques, product management, and quality enhancement. These interventions helped raise yields. At one location, Gerbicha Kebele, women produced on average 2.6 tons per hectare, above the national average of 2 tons per hectare. Two women exceeded this amount, producing 3 tons per hectare.[b]

LOOKING AHEAD

Despite the extensive work carried out by many organizations to strengthen Ethiopia's seed systems, challenges remain. Some farmers continue to achieve only modest yields, and efforts are still needed to increase seed production and in parallel stimulate additional demand in the marketplace. A new project, the Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA), will build on the successes of the Tropical Legumes projects and continue enhancing the efficiency and effectiveness of breeding programs and seed systems in Ethiopia and other African nations.

[c] Calculations are based on an average plot size of 0.2 hectares per household, seeding rate of 0.12 tons/hectare for chickpea and 0.07 for common bean, and a price/ton of US$503.90 for chickpea and US$601.70 for common bean. These prices are averages taken from FAOSTAT figures for 2007–2017.

TROPICAL LEGUMES HUB

Find out more about the Tropical Legumes projects at **www.tropicallegumeshub.com**

PARTNER: ETHIOPIAN INSTITUTE OF AGRICULTURE RESEARCH EIAR

LED BY: ICRISAT INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS; CIAT; IITA Transforming African Agriculture

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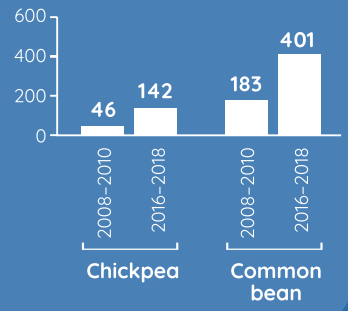
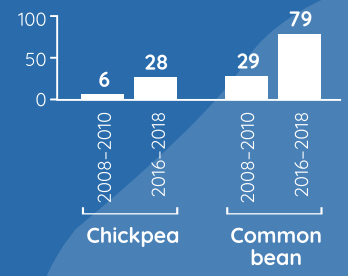
Households
(estimated number that could grow the improved seed annually, in thousands)[c]



Economic value
(estimated average annual value of grain produced from the improved seed, in US$ million)[c]



Find out more: Varshney, R.K., Ojiewo, C., Monyo, E. A decade of Tropical Legumes projects: Development and adoption of improved varieties, creation of market-demand to benefit smallholder farmers and empowerment of national programmes in sub-Saharan Africa and South Asia. *Plant Breeding* 2019; 138: 379–388.