

Accelerated Breeding



Accelerated Breeding aims to develop better-performing crop varieties, providing real-time adaptation to climate change, evolving markets, and production systems. It forms part of CGIAR's new Research Portfolio, delivering science and innovation to transform food, land, and water systems in a climate crisis.

Objective

The Accelerated Breeding Initiative supports CGIAR and national breeding programs to streamline their work with the aim of accelerating the development of better-performing, farmer-preferred crop varieties that deliver greater rates of genetic gain per dollar invested. Reducing the average age of varieties in farmers' fields helps improve real-time adaptation to growing challenges including climate change and evolving markets and production systems.

The Challenge

Farmers in the developing world need to grow better-performing crop varieties to help them cope with a range of challenges, including a projected 50 to 60 percent increase in demand for food in the face of climate change, natural resource constraints, and diet-related and food safety issues. Climate change alone will reduce crop productivity by about 5 percent for every degree of warming above historical levels.



However, many smallholder farmers are still growing old varieties that cannot fight off these new threats. This is in part because they derive inadequate benefits from recent breeding efforts, which have not always adopted the best strategies, technologies, and practices and are therefore not delivering the complex traits needed to meet current challenges and farmers' needs. To trigger timely adoption, new varieties must offer a step-change in performance, including greater resilience and improved nutritional value. They must also be widely available and affordable.

Breeding programs also need a greater focus on developing farmer- and consumer- preferred varieties adapted to distinct production environments, markets, and end uses. This can be facilitated by smarter design of breeding programs; stronger partnerships between CGIAR, National Agricultural Research and Extension Systems (NARES) and small- and medium-sized enterprises (SMEs); and strengthened organizational capacity.

AT A GLANCE

Primary CGIAR impact area: Nutrition, Health & Food Security

CGIAR science group: Genetic Innovation

Focus countries: Low- and middle-income countries, particularly in sub-Saharan Africa and South Asia

Works towards sustainable development goals: No poverty; Zero hunger; Gender equality; Decent work and economic growth; Reduced inequalities; Responsible consumption and production; Climate action; Life on land; and Partnerships for the goals





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Activities

The Initiative’s work builds on CGIAR’s unparalleled legacy of crop breeding which, in catalyzing the Green Revolution, is credited with saving a billion lives. Activities are focused on the following areas:

Aligning breeding teams and breeding objectives with farmers’ needs (ReFOCUS)

Realistic assessments of breeding ambitions are key to rationalizing CGIAR breeding investments. This strand of work ensures that breeding teams commit to developing a portfolio of distinct, achievable product profiles – each a unique combination of productivity, adaptation, resilience, quality, processing, and end-use traits – within a defined timeframe and at a given investment. The profiles are then prioritized, and this is used to guide and direct breeding work across the CGIAR network.

ReORGANIZE breeding teams to drive efficiency gains

Modern breeding organizations drive efficiency gain, opportunity identification, and operational effectiveness through the coordinated engagement of subject-matter specialists and processes. Capitalizing on engagement across CGIAR’s new portfolio of research, this area of the Initiative’s work realigns breeding activities and teams along agile “form follows function” lines (trait discovery, trait deployment, population improvement, and variety validation), to accelerate genetic gains and ensure alignment with prioritized current and future product profiles. It establishes a common organizational framework, defines appropriate stage gates, cross-cutting and commodity/stage specific key performance indicators (KPIs) and handover criteria, including to colleagues working on the Seed Equal Initiative. It documents procedures and standards, and assesses and learns from efficiency gains.

TRANSFORM towards inclusive, impactful CGIAR-NARES-SME breeding networks

TRANSFORM aims to evolve the 500-plus NARES and SME crop breeding programs currently running in Africa and South Asia to make sure human and operational capacity is being fully utilized, and to increase ownership and empower local partners. Its work includes implementing approaches to guide decision-making and support partners to assume greater responsibility in the implementation of collaborative breeding approaches, providing them with the necessary skills, tools, and resources. It also supports the sharing of outputs, the scaling of knowledge across the CGIAR network, and the development of metrics for assessing performance.



Trait discovery and deployment (DISCOVER)

Accessible and relevant trait variation is fundamental to the delivery of genetic gain. This work aims to drive, rightsize and synergize trait discovery and deployment (TD&D) activities with the aim of better responding to the trait needs of core breeding pipelines and the markets they serve. This work aims to drive, rightsize and synergize trait discovery and deployment (TD&D) activities with the aim of better understanding, optimizing and delivering the trait variation demanded by core breeding pipelines and the markets they serve.

ACCELERATE population improvement and variety identification

ACCELERATE leverages tools and services from the Breeding Resources Initiative and elite parental lines carrying high-value traits from Accelerated Breeding-DISCOVER to execute and optimize CGIAR-NARES-SME breeding pipelines, increasing realized rates of genetic gain oriented towards the prioritized set of crops and product profiles. It aims to accelerate breeding cycles, implement best-practice phenotyping, molecular, and data management approaches, shift trialing to better reproduce farmers' environments and management practices, and deliver more productive, nutritive, climate-resilient varieties, including those offering new marketing and income opportunities to farmers, women, and marginalized groups.

“ We can
accelerate results
in farmer fields
by smarter design
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Outcomes

Proposed three-year outcomes include:

- Increased genetic gain and varietal turnover, with at least 70 percent of breeding pipelines having increased the rate of genetic gain in the form of farmer-preferred varieties, and with at least 50 percent providing significantly improved varieties to seed system recipients.
- Tighter market focus, with 75 percent of breeding pipelines to be oriented towards specific market segments, enabling greater focus on farmers' needs, drivers of adoption, and the strategic allocation of resources for maximum impact.
- Greater operational effectiveness, with 70 percent of breeding pipelines using a revised organizational framework that provides operational clarity and effectiveness.
- Stronger NARES partnerships, with 80 percent of breeding networks having taken documented steps towards stronger partnerships, where NARES and SMEs have increased breeding capacity, and make greater scientific, operational, and decision-making contributions to the breeding process.
- Increased focus on TD&D, with 50 percent of breeding pipelines supported by a dedicated TD&D program that delivers high-impact traits in the form of elite parental lines.

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CGIAR is a global research partnership for a food-secure future. CGIAR science is dedicated to transforming food, land, and water systems in a climate crisis. Its research is carried out by 13 CGIAR Centers/Alliances in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector. www.cgiar.org

We would like to thank all funders who support this research through their contributions to the CGIAR Trust Fund: www.cgiar.org/funders.

To learn more about this Initiative, please visit on.cgiar.org/AcceleratedBreeding.

To learn more about this and other **Initiatives in the CGIAR Research Portfolio**, please visit www.cgiar.org/cgiar-portfolio

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INITIATIVE ON
Accelerated Breeding