

Goal

Since 1978, the Genetic Resources Program at the Alliance of Bioversity International and CIAT has safeguarded the world's largest and most diverse collections of beans and tropical forages, focusing on their long-term conservation and sustainable use in line with the ITPGRFA. The program advances seed conservation methods, enhances the value of its collections, and trains future scientists in genetic resources management and research.



Where we work

Located in the Future Seeds Building on the Alliance campus in Palmira, Colombia, the Seed Conservation Laboratory houses one of the most significant genebanks in the world. This facility plays a vital role in safeguarding global agricultural biodiversity, ensuring the long-term conservation of genetic resources essential for food security and climate resilience.

The bean collection includes over 37,900 accessions from 47 Phaseolus species and 13 interspecific hybrids, originating from 114 countries. **The tropical forage collection comprises more than 22,600 accessions** from 75 countries across the tropical belt in the planet, encompassing 696 identified species belonging to 128 genera. Together, these collections represent an extraordinary breadth of genetic diversity and serve as a foundation for research, breeding, and sustainable agriculture initiatives worldwide.

How we do it

- **Seed Reception Area:** This is where the seeds harvested from the field are received. They are dried under controlled conditions, threshed, and cleaned.
- **Seed Purity Verification Area:** In this area, seeds are screened for physical quality. The best-quality seeds are selected, quantified, and representative samples are taken to assess their viability and health.
- **Seed Viability Lab:** This laboratory assesses physiological seed quality through germination and tetrazolium tests, following ISTA protocols for both recently harvested and long-term conserved samples.
- **Seed Packing and Conservation Area:** Seeds are packed, stored, and prepared for distribution to end-users, both nationally and internationally.

The impact



Distribution: Over 500,000 samples sent to more than 110 countries.



Conservation: More than 92% of the accessions from the two seed collections are conserved as safety duplicates at the CIMMYT genebank and the Svalbard Global Seed Vault, ensuring secure long-term preservation under international standards.



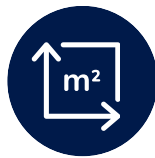
Collaborations: Breeding, research, and education programs worldwide.

This genebank supports global efforts to adapt to climate change, improve crop productivity, and preserve agrobiodiversity for future generations through collaboration with national programs, universities, and international research institutions.

Actions for innovation



Future Seeds: It features facilities with controlled temperature, relative humidity, and pressure differentials to ensure higher quality throughout the drying chain in seed conservation processes for long-term storage.



Automated seed characterization Lab: Uses X-ray, multispectral imaging (Videometer), and NIRS (FieldSpec) to assess viability, shape, color, and nutritional content without destroying seeds.



Innovation focus: Aims to reduce destructive testing and enrich collections with advanced data for better accessibility and use.



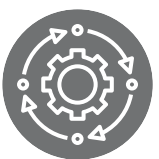
RFID implementation: Enhances seed traceability and streamlines inventory management.

Technologies



X-ray System: Internal seed characterization.

The X-ray system is used to assess grain filling, detect morphological anomalies and out-of-spec seed patterns, and predict seed viability non-destructively. It enables fast, non-invasive analysis, supports quality control in seed conservation, and improves data integration into seed collection records.



Videometer System: Multispectral seed imaging and trait characterization.

The Videometer is a multispectral imaging device that uses 19 wavelengths (UV to near-infrared) for seed phenotyping. It is currently being calibrated to accurately assess bean seed traits such as color, shape, size, and dimensions—providing valuable data for plant breeders and researchers to select and classify germplasm with desirable traits.



FieldSpec (NIRS System): Non-destructive analysis of seed nutritional composition.

Technology Overview:

The FieldSpec uses Near-Infrared Reflectance Spectroscopy (NIRS) to rapidly analyze the chemical composition of seeds without the need for grinding or destruction.



Currently Applications:

- Quantification of nutritional components such as protein, Iron and Zinc
- Support for screening germplasm to add nutritional profiles to the bean collection.
- Integration of compositional data into genebank documentation systems.

Benefits:

- High-throughput and non-invasive.
- Enhances the value of seed collections by adding functional trait data.
- Supports nutritional breeding and food security research.

To know more about the program, visit us:



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