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Why Conserve Crop Diversity?

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Crop diversity is the foundation of our food. For millennia, food plants have been domesticated, selected, exchanged, and improved by farmers in traditional ways, within traditional production systems (Plucknett *et al*., 2014). In the 20th century, this process was hugely accelerated and focused by scientific crop improvement, leading to historic achievements such as the Green Revolution and the steady rise in yields since then. Half of the increases in food production globally can be attributed to genetic improvement, whose benefits also include reduced reliance on environmentally harmful inputs, more stable yields and higher nutritional value.

At the same time, the world still has two billion people who are malnourished, and of these about 749 million do not get enough calories (IFPRI, 2015). Meanwhile, the rate of yield gains is decreasing for some major food crops and climate change has introduced additional, urgent challenges. Adaptation of agriculture will be crucial to ensure food security for a global population of nine billion people in 2050. Today, modern tools allow researchers to be more accurate and efficient in managing and using genetic diversity. However, for plant breeders to continue delivering benefits, they require continued access to plant genetic diversity from around the world.

Recognition of the significance of crop diversity is epitomized by the agreement of a global treaty addressing the issue, the International Treaty on Plant Genetic Resources for Food and Agriculture (Plant Treaty), which came into force in 2004. Now ratified by more than 135 countries, it provides a legal framework for how crop diversity is conserved and made available for nutritional security. More recently, the UN Sustainable Development Goals (SDGs) have challenged the global community to eradicate hunger. The SDGs recognise the important role crop diversity plays in helping us achieve this goal, and explicitly call for its protection by the year 2020 (in Targets 2.5 and 2.a).

Role of Plant Genebanks

Much of the world's genetic diversity of crops was lost as agriculture developed. The establishment of many of the world's genebanks took place during the 1970s and 1980s in an atmosphere of crisis. Every day, traditional crop varieties and their wild relatives were disappearing from farmers' fields and from natural ecosystems, cast aside in favour of genetically uniform, potentially high-yielding types or victim to changing cropping patterns and habitats. This led to the mobilization of a worldwide effort to collect imperilled crop genetic resources for safeguarding in genebanks.

This eleventh hour rescue effort would eventually lead to the establishment of about 1,700 genebanks around the world, holding more than 7 million accessions. These include the genebanks of the CGIAR centres, which collectively host the foremost international effort to conserve and manage crop, forage and agroforestry genetic resources. One of these genebanks, that of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is located in India, in Hyderabad.

Despite their prescience in setting up crop diversity collections, however, a large number of genebanks established during the crisis years did not make sufficient provision for on-going financial support. Many of the collections maintained in developing countries are in a precarious state. And even the best of them struggle for funding. Reliable long-term conservation requires stable, long-term financial support.

Crop diversity in farmers' fields is diminishing too, and the wild relatives of our food crops continue to disappear in their natural habitats – be it by clearing of forests or urban sprawl. In short, agrobiodiversity today is threatened on three fronts: in the wild, in farmer's fields, and even in the crop genebanks that are intended to be safe houses for the future. We must secure safe havens from the threats posed in all of these places.

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Role of the Crop Trust

The reliability of genebank funding is absolutely crucial given that a shortfall in financial resources can lead to the permanent loss of unique varieties. The Crop Trust's objective is to ensure stable, predictable funding for a global system of crop collections, in perpetuity, from an endowment fund.

This global system of crop diversity is based on three pillars: international crop collections (as shown in Table 1); national and regional collections of the highest importance for food security; and the Svalbard Global Seed Vault, the final back-up of the world's crop collections.

International crop collections

The Crop Trust has signed agreements to provide 'in perpetuity' funding to some of the world's most important collections of 17 crops (Table 2), all recognized under Article 15 of the Plant Treaty. These are among the most comprehensive and widely used collections of crop diversity. A partnership between the CGIAR and the Crop Trust has ensured stable funding for the genebanks for the past 5 years, and a proposal is in place to extend this guarantee for another six years. Over time, the Crop Trust will be able to secure more and more crops through fully-funded long-term grants from its endowment. Genebanks provide technical and financial reports to the Crop Trust through an Online Reporting Tool, and 19 agreed Performance Indicators are monitored for each of the crop collections involved. The goal is to make this diversity available to breeders and researchers in a manner that meets international scientific standards, and which is cost efficient, secure, reliable, sustainable over the long-term and supportive of the Plant Treaty.

National Crop Collections

Beyond the Article 15 collections, the Crop Trust is also planning to help conserve and make available other key collections of the 25 Annex 1 crops which are most important to agriculture in Least Developed Countries (LCDs), as reflected by production statistics. Global crop strategies have been developed, and will be revised, to help identify priority collections for both short- and long-term support.

The Svalbard Global Seed Vault

Deep inside a mountain on a remote island in the Svalbard archipelago, halfway between the northern-most tip of mainland Norway and the North Pole, lies the Svalbard Global Seed Vault. This is a fail-safe, last-chance backup facility for the world's crop diversity. It currently holds more than 860,000 samples of crop

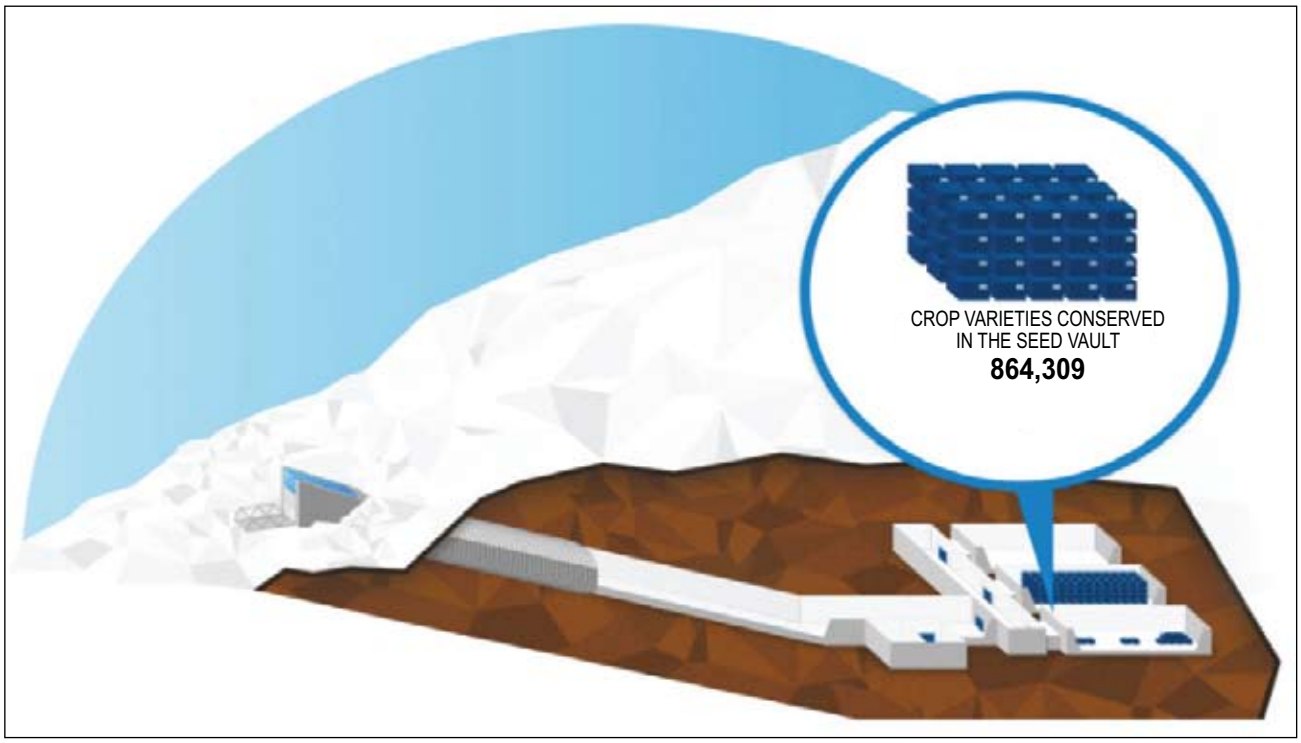

Table 1. Genebanks supported by the Crop Trust through Long-Term Grants from the Endowment Fund and the Genebanks CRP

CGIAR Center	Country	Crops	# of Crop Accessions
Africa Rice	Benin	Rice	19,983
International Institute for Tropical Agriculture	Nigeria	Cowpea, yam and cassava	30,388
Bioversity International	Belgium	Banana	1,455
International Maize and Wheat Improvement Center	Mexico	Maize and wheat	175,526
International Center for Agricultural Research in the Dry Areas	Syria	Barley, chickpea, faba bean, forages, lentil and wheat	136,350
International Center for Tropical Agriculture	Colombia	Bean, cassava and forages	67,574
International Crops Research Institute for the Semi-Arid Tropics	India	Chickpea, groundnut, minor millet, pearl millet and sorghum	129,081
International Livestock Research Institute	Kenya	Forages	17,716
International Potato Center	Peru	Andean roots and tubers, potato and sweet potato	15,756
International Rice Research Institute	Philippines	Rice	121,595
World Agroforestry Center	Kenya	Agroforestry trees	5,490
Centre for Pacific Crops and Trees	Fiji	Aroids and yams	1,467

Table 2. Long-Term Grants provided by the Crop Trust

- Edible Aroids – SPC
- Banana and Plantain – Bioversity International
- Barley – ICARDA
- Bean – CIAT
- Cassava – CIAT
- Cassava – IITA
- Chickpea – ICRISAT
- Faba bean – ICARDA
- Forages – ICARDA
- Forages – ILRI
- Grass pea – ICARDA
- Lentil – ICARDA
- Maize – CIMMYT
- Pearl millet – ICRISAT
- Rice – IRRI
- Sorghum – ICRISAT
- Sweet Potato – CIP
- Wheat – CIMMYT
- Yam – SPC
- Yam – IITA

diversity from more than 60 genebanks, and nearly every country in the world. The Crop Trust maintains the Vault in partnership with the Norwegian government and the Nordic Genetic Resources Center, which is responsible for its management and operation.

Last October, seeds were withdrawn from the Global Seed Vault for the first time when ICARDA, the international agricultural research centre formerly based in Aleppo, Syria withdrew 40,000 of its crop accessions in order to re-establish collections in facilities in Lebanon and Morocco. This demonstrates that the Vault can help overcome the kinds of crises that may threaten genebanks in these turbulent times.

The Crop Trust's work is not restricted to long-term funding for plant genebanks. It also implements short-term, strategic projects that underpin the global system and strengthen crop diversity conservation worldwide. This includes efforts to collect, conserve and use the wild relatives of 29 crops of global importance to food security, adding them to the pool of resources available under the Plant Treaty. The Crop Trust is also building an information system to ensure ready access not just to the diversity itself, but also to any information that exists about it: Genesys, an online portal bringing together information from genebanks worldwide. The Crop Trust has also supported, in close partnership with the United States Department of Agriculture, the development of the GRIN-Global genebank data management software.

Securing the world's food supply is going to require support and work beyond crop diversity conservation. Yet nothing in agriculture can be effective if the genetic base of our food supply is lost. Genebanks are vital to a sustainable and healthy food system for our children's children.

References

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