Svalbard
Global Seed Vault

10 YEARS 2008–2018
Safeguarding seeds for the future

NordGen

Conservation and sustainable use of plant genetic resources

Svalbard Summit 2018: Summary of Conclusions

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Compiled by Jonathan Drori, The Eden Project
Assisted by a reference group consisting of Grethe Evjen, Norwegian Ministry of Agriculture and Food, Charlotte Lusty and Luigi Guarino, Crop Trust and Lise Lykke Steffensen, NordGen.

At the recent 10th anniversary of the Global Seed Vault, the Svalbard Summit 2018 gathered about 100 people representing governments, gene banks, breeding companies, international biology and civil society organisations. They reflected on current approaches to conservation and sustainable use and how to increase their effectiveness. This report presents the main conclusions of these experts.

Background:

All human life depends on plants

All human life depends on plants, whether we eat them (or the animals that consume them), or use their fibres for clothing, or depend on the chemicals they produce, from medicines to industrial raw-materials. Humanity should therefore take great care to understand and safeguard overall plant biodiversity though for nutrition we all especially depend on the crop species and their genetic diversity.

What are Plant Genetic Resources?

"Plant genetic resources" are any genetic material of plant origin of actual or potential value for human use. The most important plant genetic resource for food and agriculture are the seeds of crops and their wild relatives. These seeds contain the genetic material for future generations. Farmers re-sow seeds from their crops, store seeds from year to year and acquire them from commercial and other organisations. The seeds and other parts of plants that can also contain useful genetic resources are stored in 'gene-banks'. In addition to storing genetic material from present crops, it is vital to conserve the broad genetic diversity of crop wild relatives, which are important for breeding plants with new characteristics, such as pest or drought tolerance.

The Svalbard Global Seed Vault is only part of the story.
The Svalbard Global Seed Vault is a final insurance, safeguarding crop diversity from many countries, should disaster or disease strike a gene bank. Although the Seed Vault today stores approximately one million different seed samples from gene banks all over the world, the Seed Vault is only one of multiple measures needed to safeguard crop diversity. A coherent global conservation system is best described as a network of different conservation methods, including in situ, on-farm and ex situ efforts at local, national and international levels.

Different conservation approaches must complement each other
The summit addressed different methods for conservation and sustainable use of plant genetic material. Experts considered the current gaps between these conservation methods and also their interdependence, recognizing that the methods for conservation and sustainable use must be compatible and complement each other.

Crop diversity should be conserved through various complementary method

In situ
In situ conservation is a method for preserving crop species, especially crop wild relatives, in nature. In situ locations are usually in protected areas, like nature reserves and other places with restricted access. Conserving crop wild relatives in this way, within natural ecosystems, is both practical and also facilitates the continuing adaptation process. This can lead to the evolution of useful traits (e.g. disease resistance) that in the future may help farmers to improve their yields and to reduce the need for pesticides. To ensure that researchers and plant-breeders have easy access to the material and to sustain its genetic purity, the in situ plants need back-ups stored in ex situ facilities.

On-farm
On farm conservation aims to conserve diversity in farmers' fields as an integrated part of farm activities. This can maintain the adaptive capacity of the plant varieties as well as the associated traditional knowledge and farming practice. The ongoing cultivation will cause the plants to continue to evolve and adapt. But also encourages farmers to increase their knowledge and awareness of crop diversity.

In situ and on-farm conservation require cooperation with ex situ conservation methods, for example so that crops that have been lost from farmers' fields or nature reserves can be reintroduced from national gene banks.

Ex situ
Community seed banks conserve seeds that have been donated by farmers. The seed bank conserves the seeds and germinates and multiplies them so that farmers have easy access to seed varieties with diverse traits and which are well adapted to the local conditions. These community seed banks can also provide farmers with access to education and training and even assistance from plant-breeders and scientists. To reduce the risk of genetic material being lost, the crop diversity stored in community seed banks should also be replicated in national gene banks.

National and regional gene banks conserve and provide access to crop diversity originating from a country or region. The material may originate from collecting missions or from plant material previously in use by farmers or breeders and which they have donated to the gene bank. These gene banks provide back-up facilities for the community seed banks and in situ conservation, as well as providing general assistance and advice. National and regional gene banks give crop-breeders, scientists and others access to their material for research, breeding and educational purposes, and also conserve material of historic or cultural value. National and regional gene banks may also use the Svalbard Global Seed Vault for long-term security storage.

International gene banks focus on specific crops, or groups of crops, but they attempt to have global coverage. These gene banks focus on conservation, research and crop-breeding activities that include the whole 'gene pool' (all the genetic diversity associated with a crop, including its relatives). The international gene banks can provide back-up of material stored in national and regional gene banks and also assist them in repatriation of their material. Most of the international gene banks also safeguard their seeds in the Svalbard Global Seed Vault.

Svalbard Global Seed Vault is the ultimate back-up storage for the world's crop diversity. About 50% of the world's known crop-seed diversity in gene banks is now safeguarded there. Remaining gene banks are being encouraged to make use of the facility. These include international, regional and national gene banks, and resources held by private companies. (The depositor remains the owner of the material deposited). The International Treaty on Plant Genetic Resources for Food and Agriculture has recognized the Seed Vault as a critical component of global efforts to conserve plant genetic resources.

Vegetative material, (parts of crop plants other than seeds) are also conserved ex situ and are used as propagating material for crops that do not easily or predictably reproduce from seeds, such as bananas, potatoes, sweet potatoes and cassava. There are various techniques:

- In- field collections enable farmers to see clearly the characteristics of the growing plant.

- In vitro methods safeguard the material from being lost, and give farmers and researchers access to healthy material that is not infected by diseases.

- Cryopreservation at extremely low temperatures can preserve plant genetic material for long periods, as long as there is a reliable supply of liquid nitrogen. There is a need to develop detailed cryopreservation protocols for more crop species and also to investigate whether a global long-term cryopreservation facility should be established.

Context for conclusions:

A. **Plant genetic diversity is crucial for food-supply resilience and for the capacity of agriculture to adapt to climate change and natural disaster. Yet climate change is itself a major threat to plant biodiversity. Humanity must therefore acknowledge and continue to attempt to tackle the causes of climate change.**

B. The Sustainable Development Goals adopted by the UN General Assembly in 2015 confirm the intimate and immediate link between its Goal 2: *'to end hunger, achieve food security and improved nutrition and promote sustainable agriculture*', and crop diversity.
Its target 2.5 states, *'By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.'*

Conclusions and recommendations:

Governments need to encourage multiple methods for conservation and sustainable use all the way from farmers' fields to the Global Seed Vault in Svalbard and back again.

To achieve this; Governments should prioritize three urgent tasks:

1. **To facilitate improvement of community seed banks and the multiplication of the seeds they contain.** This will conserve crop diversity that has been saved by the farming community. It will give local farmers easy and timely access to diverse and locally-adapted seeds. It will also give access to education and training, and possibly to seed-ownership and associated income opportunities.

2. **To address the need to regenerate and maintain seed collections in many gene banks.** It is important to maintain, conserve and provide facilitated access to the plant genetic resources in national and geographic gene banks. This will save the cultural heritage of a country or region, and also provide access to vital traits for future agriculture and food production in a changing climate. This activity will also enable the gene banks to send fresh seeds to Svalbard Global Seed Vault for long term safety deposit.

3. **To expand and strengthen the global system for conservation and sustainable use of crop diversity.** To complement conventional seed banks, there is a need to develop in situ conservation of crop wild relatives, as well as in vitro and cryopreservation techniques and protocols. The discussion of associated information systems for storing and manipulating digital crop diversity and genomic data (in silico) should continue in Treaty settings, and in discussions surrounding the Convention on Biological Diversity.