

## **Global Crop Diversity Trust and Svalbard Global Seed Vault Frequently Asked Questions**

### **What is the purpose of the Svalbard Global Seed Vault?**

The purpose of the Svalbard Global Seed Vault is to provide insurance against both incremental and catastrophic loss of crop diversity held in genebanks around the world. The Seed Vault offers secure protection for one of the most important natural resources on earth. It serves as an essential element in a global network of facilities that conserve crop diversity and make it available for use in plant breeding and research.

Unfortunately, a significant portion of the agricultural diversity that has existed on farms has been lost, especially in the last century. Thankfully, much of that diversity has been collected and stored in genebanks before it disappeared. Genebanks play a vital role in conserving varieties of crops that can no longer be found in farmers' fields.

But genebanks are not 100% safe. Subject to funding cuts, equipment malfunction, energy failure, natural disasters, civil strife, war, or simple mismanagement, some genebanks have lost portions of their collections. The loss of a seed sample can mean the extinction of the variety it represents, and the loss of the opportunity to benefit from that variety's unique characteristics. Each loss of a sample therefore decreases the options available to agriculture worldwide.

The Svalbard Global Seed Vault is the world's only global backup seed storage facility for crop diversity. The Seed Vault provides a safety duplication of seed samples stored in genebanks worldwide, including international, national, and regional institutes. If the depositors lose samples in their own genebanks, they will be able to retrieve the duplicates stored at Svalbard, and replenish their collections. The Seed Vault does not solve the problem of continued loss of diversity in farmers' fields, but does provide a safety net for the genebanks working to conserve what diversity has been collected. Furthermore, in the case of a large-scale regional or even global disaster, the remote and secure location of the Seed Vault gives the seeds representing the world's agricultural diversity the best chance of survival.

### **What are the main differences between the Svalbard Global Seed Vault and other genebanks?**

The Seed Vault is a kind of insurance policy for other genebanks. Plant breeders and researchers depend on genebanks around the world to obtain varieties with useful traits that they need. If those genebanks lose their own resources, because of natural or man-made disaster, the collections can be restored by retrieving the copies from Svalbard.

Genebanks that are active in conservation and distribution must include a range of activities beyond just storing seeds. These tasks include regenerating seeds in the field when they grow old, testing seeds for viability, maintaining seed health, multiplying seed samples so that there is adequate seed for distribution, etc. The Seed Vault provides the highest quality conditions for seed storage, and monitors those

conditions to ensure that they remain ideal. The Seed Vault does not monitor the regeneration, multiplication and other needs of individual seed samples, and does not distribute seeds (except back to the depositing genebanks)- these tasks are the responsibility of the depositing genebanks, working within their own collections. For example, the Seed Vault does not provide facilities for regenerating seeds when they grow old. Instead, when those seeds grow old in the depositing genebanks, those genebanks will regenerate and then send fresh seeds to Svalbard to replace the aged seeds. As the Seed Vault is not involved in regeneration and other activities, staff persons are not required on site, aside from during occasional seed deposit and facility maintenance periods.

### **What are the dimensions of the Svalbard Global Seed Vault?**

The distance from the front door of the portal building to the back of the Seed Vault is approximately 145.9 meters (478.7 feet). The width of the each storage room is approximately 9.5 to 10 meters (31.2 to 32.8 feet), the height is 6 meters (19.7 feet), and the length is approximately 27 meters (88.6 feet).

### **Who owns the Svalbard Global Seed Vault?**

The Seed Vault is owned by the Government of Norway. Statsbygg <http://www.statsbygg.no/English/>, the Norwegian Directorate of Public Construction and Property owns the facility. The Seed Vault is administered by the Norwegian Ministry of Agriculture and Food <http://www.regjeringen.no/nb.html?id=4> on behalf of the Kingdom of Norway.

### **Who runs the Svalbard Global Seed Vault?**

Under the terms of a tripartite agreement between the Norwegian Government, Global Crop Diversity Trust, and Nordic Genetic Resource Center (NordGen), responsibility for the management of the Seed Vault lies with NordGen, the regional genebank of the Nordic Countries, located in Alnarp, Sweden. An International Advisory Council oversees the management and operations of the Seed Vault.

There are no permanent staff persons on-site. NordGen staff travel to Svalbard as necessary to monitor the facility and process new shipments when they arrive. Local officials also monitor the facility using electronic surveillance.

NordGen <http://www.nordgen.org/sgsv/> maintains the public on-line database of samples stored in the Vault.

### **How much did it cost to build the Svalbard Global Seed Vault?**

The construction cost for the Seed Vault was approximately 48 million Norwegian Kroner (NOK)\ \$9 million (USD). The cost was funded entirely by the Kingdom of Norway.

**Who funds the operations of the Svalbard Global Seed Vault?**

The Global Crop Diversity Trust is supporting the operations of the Seed Vault by providing \$125,000 to \$150,000 annually. Norway will also provide funding for the ongoing maintenance of the Seed Vault, at a cost of approximately \$100,000 a year.

Storage of seed samples in the Seed Vault is free. Genebanks are responsible for paying shipment charges to Svalbard, and for the costs of return shipment, if necessary. The Trust, through a partnership with United Nations Foundation funded by the Bill & Melinda Gates Foundation, is financing the preparation and shipment of seeds from genebanks in developing countries and the international agricultural research centers.

**Who are the donors to the Global Crop Diversity Trust?**

The Trust has a broad range of funders from different sectors. Current donors include developing and developed country governments, foundations, the private sector, farmers' organizations and individuals. The complete current list of donors can be found here <http://www.croptrust.org/main/donors.php>

**Who can store seeds in the Svalbard Global Seed Vault?**

The facility can be used free of charge by any genebank or seed conservation organization in any country.

**Who has stored seeds in Svalbard Global Seed Vault?**

Twenty-one genebanks contributed to the first deposit of seeds into the Seed Vault in January-February 2008. These genebanks included international genebanks of the Consultative Group on International Agricultural Research (CGIAR), other international and regional genebanks, national genebanks, and a non-governmental organization (NGO). A current list of depositors and related information can be found on the Vault website managed by NordGen [http://www.nordgen.org/sgsv/index.php?app=data\\_unit&unit=sgsv\\_by\\_depositor&HPSESSID=3b1td0arodcnhufcvf6p5mv8h7](http://www.nordgen.org/sgsv/index.php?app=data_unit&unit=sgsv_by_depositor&HPSESSID=3b1td0arodcnhufcvf6p5mv8h7).

**Who owns the seeds in the Svalbard Global Seed Vault?**

The Seed Vault functions like a safety deposit box in a bank. The bank owns the building and the depositor owns the contents of his or her box. Statsbygg, the Norwegian Directorate of Public Construction and Property, owns the facility, and the depositing genebanks own the seeds they send. The deposit of samples in Svalbard does not constitute a legal transfer of genetic resources. There is no transfer of ownership.

Each depositor signs a Deposit Agreement

[http://www.nordgen.org/sgsv/index.php?page=depositor\\_guidelines](http://www.nordgen.org/sgsv/index.php?page=depositor_guidelines) with NordGen, acting on behalf of Norway. The Agreement makes clear that Norway does not claim ownership over the deposited samples and that ownership remains with the depositor, who has the sole right of access to those materials in the Seed Vault. The boxes with seeds are sealed by the depositors and will not be distributed to or given access to by

anyone other than the depositors. No one has access to anyone else's seeds from the Seed Vault.

### **Who can access the seeds in the Svalbard Global Seed Vault?**

Ownership remains with the depositor, who has the sole right of access to the materials in the Seed Vault. No one has access to anyone else's seeds.

The seed samples stored in the Seed Vault are copies of samples stored in the depositing genebanks. The samples stored at the genebanks are accessible in accordance with the terms and conditions of the International Treaty on Plant Genetic Resources for Food and Agriculture <http://www.planttreaty.org/>.

### **Do the owners or financial supporters of the Svalbard Global Seed Vault or the Global Crop Diversity Trust have access to the seeds?**

The depositor has the sole right of access to materials stored in the Seed Vault. No one has access to anyone else's seeds from the Seed Vault.

### **Why Norway? Why Svalbard?**

Svalbard was considered an ideal physical location for a long-term seed storage facility requiring minimal operational costs. The arctic permafrost offers natural freezing for the seeds, a key requirement for long-term conservation. Additional mechanical cooling down to -18° Celsius, the international standard, is easily accomplished.

- The technical conditions at the site were virtually perfect. The location inside a mountain obviously increases security and provides unparalleled insulation properties. The area is geologically stable. Radiation levels inside the mountain are quite low. Humidity is relatively low. And it was possible to position the facility far above the point of any projected or possible sea level rise due to climate change (130 meters /430 ft above sea level).
- Svalbard is remote and yet accessible. Seeds can easily be transported to and retrieved from Svalbard, and the area has good communications links.
- Infrastructure is excellent. Locally mined coal provides power generation. Even if the equipment fails, a considerable time will elapse before the temperature rises to the -3 °C (27 °F) of the surrounding sandstone bedrock.
- The political situation is stable. The local government is highly competent and helpful. The local community also is small and supportive.
- There is experience in storing seeds and managing underground sites in Svalbard. The Nordic countries have been conserving a backup collection of their seeds in a coalmine in Svalbard since 1984.

- Norway is a trusted country. It also is unusually “global” in its outlook, and generous when it comes to supporting positive international initiatives. Norway has no perceived conflict of interest in hosting the site.
- Military activity is prohibited in the region under the terms of the Treaty of Svalbard (1920)<sup>1</sup>.
- And finally, those involved in the conceptualizing of the project had close ties with and access to policy-makers in Norway, facilitating consideration of the proposal at the highest levels of government.

### **How is the Svalbard Global Seed Vault protected from access?**

The region on Svalbard surrounding the Seed Vault is remote, severe, and inhabited by polar bears. Anyone seeking access to the seeds themselves will have to pass through four locked doors: the heavy steel entrance doors, a second door approximately 115 meters down the tunnel and finally the two keyed air-locked doors. Keys are coded to allow access to different levels of the facility. Not all keys unlock all doors.

### **Where are the keys to the Svalbard Global Seed Vault?**

Different keys and different combinations of keys and entry cards are needed to access the different parts of the Seed Vault.

The three sets of keys providing access to the Seed Vault halls are held at NordGen in Alnarp/Ås, at the Governor’s office in Longyearbyen, and at the Statsbygg (the Directorate of Public Construction and Property) office in Longyearbyen. The Governor is the local representative of the Norwegian Government.

### **How many seeds are currently stored in the Svalbard Global Seed Vault?**

There are currently over 300,000 samples stored in the Seed Vault, totaling over 150 million seeds. For more detailed information on the seeds stored in the Seed Vault <http://www.nordgen.org/sgsv/>.

### **How many seeds will be stored in the Svalbard Global Seed Vault?**

The Seed Vault has the capacity to store 4.5 million seed samples, more than the total number of varieties in existence. Each sample contains an average count of 500 seeds, so a maximum of 2.25 billion seeds could be stored in the facility. The collection and storage of seeds will continue for some time. When just half of the first of three storage rooms is filled, it will hold the world’s largest collection of seeds.

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<sup>1</sup> Parties to the Treaty of Svalbard include: Afghanistan, Albania, Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, China, Denmark, Dominican Republic, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Italy, Japan, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, USA, United Kingdom, Venezuela.

**How are the seeds stored?**

The seeds are stored at -18° Celsius (-0.4° Fahrenheit). The seeds are sealed in specially designed four-ply foil packages, placed in sealed boxes and stored on shelves inside the Seed Vault.

**How long can seeds be stored in the Svalbard Global Seed Vault?**

If properly stored and maintained at appropriate temperatures, some seeds in the Seed Vault will probably be viable for a millennium or more. As long-term seed conservation in genebanks began only in the last century, predicting seed longevity relies on statistical extrapolations. Such research shows that seed longevity varies considerably between species. If properly stored and maintained at appropriate temperatures, some seeds in the Seed Vault will be viable for a millennium or more. For example at -20° Celsius, barley can potentially last 2000 years, wheat 1700 years, and sorghum almost 20,000 years. Even the most short-lived crop seeds typically survive for at least a half-century.

In any case, depositing institutes will monitor the viability of their own seed stocks in their genebanks. When seeds begin to lose viability (with germination rates dropping below 85 percent of the original level), management protocols specify that some seeds from the sample should be taken out, planted, and new fresh seed harvested to replenish the genebank's sample of that variety. When this process takes place, genebanks using the Seed Vault have agreed that they will send a fresh new sample to Svalbard. Thus, seed will be renewed regularly, and the Seed Vault will always have a good, healthy sample ready just in case it is needed.

**What happens if the electricity goes out?**

The arctic permafrost offers natural freezing for the seeds, a key requirement for long-term conservation. Additional mechanical cooling down to -18° Celsius, the international standard, is accomplished with only a single 10-kilowatt compressor, which is powered by locally generated electricity. If the equipment or the electricity fails, considerable time will elapse before the temperature would rise to the -3 °C (27 °F) of the surrounding sandstone bedrock, which is still satisfactory for keeping seeds frozen. Therefore there will be adequate time to have the equipment repaired before any damage is done to the seeds.

Even given worst-case scenarios for global warming, the Seed Vault storage rooms will remain naturally frozen for up to 200 years according to the Norwegian Meteorological Institute, and very cold and exceptionally well insulated for as far into the future as one can imagine. Under any scenario, therefore, the Vault remains, in absolute and relative terms, the best possible location for providing secure and reliable conditions for seed storage.

**What kinds of seeds are stored in Svalbard Global Seed Vault?**

Priority for storage will be given to samples of crops that are important for sustainable agriculture and food security. The facility will start with receiving samples from the international genebanks of the Consultative Group on International Agricultural Research (CGIAR), as well as certain national genebanks. The focus will be on

safeguarding as much of the world's unique genetic material as possible and on avoiding duplication. Among the types of seed samples held at Svalbard will be traditional varieties/landraces, modern varieties, and wild species related to crops.

The Seed Vault provides ideal conditions for the long-term conservation of most agricultural seeds. Some crops, such as banana, typically don't produce seeds. And seed of other crops, such as coconut and many tropical fruits, cannot be conserved by drying and freezing. Thus, the Seed Vault cannot protect all food crops. The Trust is working in a variety of projects with genebanks and researchers to devise and improve ways for conserving samples of such crops

<http://www.croptrust.org/main/conservation.php?itemid=295>.

The Seed Vault will house seed samples of the native plants of Svalbard. The University Center in Svalbard (UNIS) is working to collect seeds from all the flowering plant species on the islands, which total approximately 165 species.

### **Will genetically modified (GM) plants and seeds be stored in Svalbard Global Seed Vault?**

No GM seeds are stored in the Seed Vault.

Many people are curious about whether genetically modified seeds will be stored in Svalbard, and what, if any, dangers or advantages such storage might pose to other samples or to the environment. The dangers are in fact virtually non-existent. Seeds are stored at -18° Celsius in sealed, air-tight packages inside sealed plastic boxes, behind multiple sets of locked doors, deep inside a mountain in the far northern reaches of the Arctic, where there are no farms and no possibility that seeds of any agricultural crop or its relatives could survive in the natural environment.

The administration of the Seed Vault has decided against specifying which diversity is worthy of being conserved for future generations; that would be presumptuous and risky. Nevertheless, at this time, the Seed Vault does not offer storage to GM varieties. Norwegian law, introduced prior to the establishment of the Seed Vault and intended to apply more generally to research and use of genetically modified organisms in Norway, prohibits importation of GM seeds. This law also applies to their storage in Svalbard.

It should be noted that GM varieties exist for only a few crops, most genebank collections were assembled before the advent of GM technology, and almost all existing crop diversity is found in the varieties and crop wild relatives that will find a home in the Seed Vault. Therefore the Vault will accomplish its purpose of providing for the long-term conservation of crop diversity and serving as the safety backup for the world's genebanks without conserving GM seeds.

The Norwegian government has signaled that it will consider any recommendation made by the Seed Vault's International Advisory Council with regards to GM seeds in the context of the Seed Vault's purpose to secure the world's crop diversity. In the meantime, both opponents and proponents of GM seeds agree on the importance of the Seed Vault.

**Isn't it dangerous to store all the world's seeds in one place?**

The seed samples stored in the Seed Vault are "spare" copies of samples stored in the depositing genebanks. The act of depositing seeds in the Seed Vault does not diminish the samples stored in the genebanks.

Ideally each unique seed sample held in genebanks worldwide would have a "spare" copy in another genebank able to conserve and to distribute that sample effectively, as well as a copy in Svalbard. The Vault in the ideal global system acts as a further safety backup for these genebanks. This global system is actively being developed, and the Vault will play the central role as the world's only global safety duplication site for the samples held in many genebanks in many countries worldwide.

**A global disaster is unlikely. Isn't the Svalbard Global Seed Vault a waste of money?**

The major threats and the principal causes of loss of diversity in genebanks have to do with management, infrastructure, and funding problems. They are not catastrophic or apocalyptic; they are not the stuff of newspaper headlines. But they are deadly nonetheless. Given the current state of many of the world's genebanks, "doomsday" for seeds could be any day.

The world does not need to experience apocalypse in order for the Seed Vault to be useful and to repay its costs thousands of times over. The seed samples stored in the Seed Vault are copies of samples stored in the depositing genebanks. If the Seed Vault simply re-supplies genebanks with samples that those genebanks lose accidentally, it will pay for itself many times over in terms of the value of those samples to food security and sustainable agriculture.

**Why is the Svalbard Global Seed Vault important to developing countries?**

Food security is a challenge in many developing countries. Crop diversity is the resource to which plant breeders must turn to develop varieties that can withstand pests, diseases, and remain productive in the face of changing climates. Diversity therefore underpins the security of the world's food supply. Storage of seed samples from developing country genebanks in the Seed Vault will ensure that unique diversity held in genebanks in developing countries is not lost forever if an accident or disaster occurs.

**What is the name of the mountain housing the Svalbard Global Seed Vault?**

The mountain housing the Seed Vault is called "Platåberget," or "plateau mountain" in English.

**How long did it take to build the Svalbard Global Seed Vault?**

The Seed Vault was built within one year. Most of the construction was completed in about 8 months.

## **Who were the architects responsible for designing the Svalbard Global Seed Vault?**

The architect is Peter W. Sødernan at Barlindhaug Consult <http://www.barlindhaug.no/>. The building commissioner and property manager is Statsbygg, the Norwegian Directorate of Public Construction and Property.

## **What is a genebank?**

A genebank is a facility for maintaining crop diversity, typically in the form of seeds, usually stored and conserved in a frozen state. The ideal temperature is between -10 and -20° Celsius. Each different type of seed is stored in its own container, such as a bottle, can, or sealed aluminum foil package. Genebanks may also contain living plants and vegetative parts of plants, especially for crops that do not store well in the form of seeds.

## **What is crop diversity?**

Crop diversity is the biological base of agriculture. Agriculture depends on relatively few crops (only about 150 are cultivated on any significant scale worldwide); however, each comes in a vast range of different forms. They may vary, for example, in height, flower color, branching pattern, fruiting time, seed size, or flavor. They may also vary in less obvious ways such as their response to cold, heat, or drought; nutritional qualities; or their ability to tolerate specific pests and diseases. Farmers and scientists must continually draw on this irreplaceable resource to ensure productive harvests.

## **How many genebanks are there?**

According to the UN Food and Agriculture Organization (FAO), there are approximately 1400 genebanks in more than 100 countries around the world<sup>2</sup>.

## **How many samples do genebanks currently house?**

Approximately 6.5 million seeds samples are stored in genebanks today. About 1 to 2 million of these seeds are estimated to be distinct. Individual genebanks vary in size, from holding one sample to more than half a million<sup>3</sup>.

## **Who uses genebanks?**

Plant breeders and researchers are the major direct users of genebanks. The diversity stored in the genebanks is the raw material for plant breeding and is also used for basic biological research. Several hundred thousand samples are distributed annually for such purposes. The end users of genebanks are farmers, and, of course, consumers of food- everyone!

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<sup>2</sup> FAO. 1998. The State of the World's Plant Genetic Resources for Food and Agriculture. Rome, Italy.

<sup>3</sup> FAO. 1998. The State of the World's Plant Genetic Resources for Food and Agriculture. Rome, Italy.

**Is it really necessary to conserve such a big diversity of crops?**

Crop varieties have different characteristics. Not all the differences are visible to the eye. Genetic traits may contain a wealth of differences in disease resistance, adaptability to various soils and climates, different tastes, and nutritional qualities. If we ever need these unique and often hidden traits found in particular crop varieties, then we must ensure that the variety is available. And it is impossible to know which traits may be useful in 10, 25, or 100 years from now.

**What are the threats to genebanks and their collections?**

The biggest threat comes from lack of access to resources and funding. Poor management can be a major problem. Genebanks also can be subject to natural disasters, war and civil strife.

**How many plant varieties have been lost?**

It is impossible to know; no organization or government kept detailed records of all varieties of crops from past centuries. But much diversity has surely been lost. In 1903, for instance, U.S. farmers used 578 varieties of beans; some 80 years later, just 32 still existed, protected in genebanks.

**How long can seeds live in a frozen state?**

This varies from crop to crop. Some crops will survive for decades, but others such as sorghum appear capable of surviving for thousands of years in cold storage. Eventually, all seeds will lose the ability to germinate and so will die. Before this happens, seeds are taken from the stored samples and planted. Fresh new seed is then harvested and placed in storage, perpetuating the original variety.

**What crops can't be stored as seed?**

In order to preserve varieties, crops such as potato, sweet potato, cassava, yam, taro, breadfruit, apple and banana cannot be stored as seed, and instead are conserved in field collections, tissue culture, or cryopreservation (in liquid nitrogen). A number of other fruits, berries, and tuber crops also cannot be conserved by freezing seed, because there is no seed, or because the seed cannot be dried and frozen.

**How are seed samples collected?**

One must collect seeds when they are mature—typically at the end of the season. In assembling a serious collection of any crop, a collector or curator generally tries to get as much diversity as possible, including early- and late-maturing varieties, and varieties that are grown in hot and cold climates or wet and dry climates.

**Do collectors take notes on the seeds' environment?**

Collectors generally record information about the conditions in which a variety is grown as well as interview local farmers about the history and characteristics of the crop.