

The Svalbard Global Seed Vault: Securing the Future of Agriculture

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Executive Summary

This report combines the historical view and a unique moment in the story of agriculture. The formal opening of the Svalbard Global Seed Vault deep inside an Arctic mountain on February 26, 2008 marks a turning point toward ensuring the crops that sustain us will not be lost. It follows millennia of haphazard forms of protecting crop diversity, and decades of catch-up preservation efforts to save more than a million different varieties of crops. With growing evidence that unchecked climate change could seriously threaten agricultural production and the diversity of crops around the world, the opening of the Seed Vault also represents a major step toward finishing the job of protecting the varieties now held in seed banks. A quiet rescue mission is underway. It will intensify in the coming years, as thousands of scientists, plant breeders, farmers, and those working in the Global Crop Diversity Trust identify and save as many distinct crop varieties as possible.

The story of agriculture dates to some 13,000 years ago, when human societies began the transformation from hunting and gathering to forms of growing food. But the story of systematically saving varieties of crops didn't begin until less than 100 years ago. In the 1920s, plant breeders assembled collections of seeds to breed new varieties. Gradually, scientists began to sample and collect more generally in an attempt to assemble the complete diversity of each crop—before distinct varieties were lost.

These scientists delved into the makeup of these varieties. Plant breeders created variety upon variety. Today, the documented pedigrees of modern crop varieties are longer than those of any monarchy. One type of wheat, for instance, has a pedigree that runs six meters long in small type on paper, recording hundreds of crosses, using many different types of wheat from many countries. A number of crops could not be produced on a commercial scale if not for genes obtained from their botanical wild relatives and used in breeding programs.

Around the world, countries and institutions created seed banks, also called genebanks. Today, there are some 1400 collections of crop diversity, ranging in size from one sample to more than half a million. These seed banks now house about 6.5 million samples. About 1.5 million of these are thought to be distinct samples. And within each crop, the diversity of varieties is stunning. Experts, for instance, estimate 200,000 types of wheat, 30,000 types of corn, 47,000 types of sorghum, and even 15,000 types of groundnut.

Some of the more popular varieties are widely distributed in seed banks, occurring in literally hundreds of collections, while others are in just a single facility. Information systems will eventually aid in identifying unintended duplication. About half of the stored samples are in developing countries, and about half of all samples are of cereals.

The Global Crop Diversity Trust is working with the Consultative Group on International Agricultural Research (CGIAR) and seed banks from around the world to assist in preparing and

shipping seeds to the Seed Vault in Svalbard. The Trust has assembled leading experts in all of the major crops to identify priority collections. Some 500 scientists from around the world have been involved. The rescue and regeneration effort is under way, and will result in a steady flow of samples being sent to Svalbard in coming years as the genebanks produce fresh new seed. For the February 26 opening of the Seed Vault, workers will load shipments from 21 seed banks, which have sent 268,000 samples that contain about 100 million seeds.

When fully stocked, the Seed Vault will contain samples deposited by large and small genebanks, by those in developed and developing countries as well as international institutions, by those that have state-of-the-art facilities, and by those whose facilities fall far short of international standards. They will share a common desire to use the Seed Vault to insure against losses in their own facility.

Why do they want a backup? Put simply, without the diversity represented in these collections, agriculture will fail. This diversity is vital in guaranteeing a successful harvest and in satisfying our needs for variety. On one level, consumers want diversity within crops because they need wheat for pasta and wheat for bread (for which they need two types of wheat), or they want tomatoes for eating fresh and for making sauce (again, two types of tomato.) On another, farmers want diversity not just to supply consumer demands, but because different farming and environmental conditions require crop varieties with different characteristics.

Plant breeders help consumers and farmers. They have to produce varieties that are productive and popular. This is a moving target. Pest and diseases evolve, the climate changes and so do consumer preferences, and the plant breeder has to incorporate the appropriate characteristics into the variety he or she breeds. And so a farmer's field, over time, is a study of change. One has to run fast just to stay in the same place, just to beat back the pests and diseases and other constantly evolving challenges.

Three partners are overseeing the Seed Vault: the Nordic Gene Bank, the Norwegian Ministry of Agriculture and Food, and the Global Crop Diversity Trust. They have a simple purpose: provide insurance against both incremental and catastrophic loss of crop diversity held in traditional seed banks around the world. The Seed Vault offers "fail-safe" protection. 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. Its genesis lies primarily in the desire of scientists to protect against the all-too-common small-scale loss of diversity in individual seed collections. With a duplicate sample of each distinct variety safeguarded in the Seed Vault, seed banks can be assured that the loss of a variety in their institution, or even the loss of the entire collection, will not mean the extinction of the variety or varieties and the diversity they embody.

Svalbard, in the northern reaches of Norway, was chosen for a variety of reasons: The permafrost in the ground offers natural freezing for the seeds; the vault's remote location enhances the security of the facility; the local infrastructure is excellent; Norway, a global player in many multinational efforts, is a willing host; and the area is geologically stable.

In the case of a large-scale regional or even global catastrophe, it is quite likely that the Seed Vault would prove indispensable to humanity. Still, we need not experience apocalypse in order for the Seed Vault to be useful and to repay its costs thousands of times over. If the Seed Vault simply re-supplies genebanks with samples that those genebanks lose accidentally, it will be a grand bargain.