

How a ‘Doomsday vault’ stows the seeds of our future against disaster

Canada and the European Union protect biodiversity through the Svalbard Global Seed Vault

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Lex Harvey/Toronto Star

LONGYEARBYEN, Norway—You’ll need to carry a rifle if you wish to visit the world’s biggest collection of agricultural diversity. Here on Norway’s wild and [vast Svalbard archipelago](#), polar bears outnumber people — and you can never be too careful (though killing one is strictly a last resort).

In the icy tundra of Longyearbyen, the world’s northernmost town, few crops grow. But deep within its permafrost — layers of soil, gravel and sand, frozen in place — lay the keys to securing the world’s food supply, in the form of more than one million types of seeds.

Dubbed the “doomsday vault,” the Global Seed Vault has a certain sci-fi quality to it. The concrete structure jutting out of the hillside is built to withstand the most severe natural disasters, and even a nuclear bomb. But at its core, the vault’s mission is simple.

“It’s just seed storage inside the mountain,” says Åsmund Asdal, the vault’s co-ordinator. Since it was built in 2008, the vault has acted as something of an insurance policy for Earth’s biodiversity, a role of increasing importance in a world ravaged by political instability, war and the urgent threat of climate change. This threat is no more present than in the area where the vault lives: [Svalbard is heating up to seven times as fast as the rest of the world.](#)

This past December in Montreal at COP15, 190 countries pledged to protect 30 per cent of the planet’s land and oceans by 2030 — an ambitious goal that comes at a time when biodiversity is falling worldwide, jeopardizing the world’s food supply.

Around the world, crop diversity is decreasing, as food production converges around a globalized diet. A [2019 University of Toronto study](#) found just four crops — soybeans, wheat, rice and corn — occupy nearly half of the world’s agricultural lands. When a small number of crop genotypes dominate globally, that makes our food supply more vulnerable to disease and disaster.

Already strong partners in the fight against climate change, Canada and the European Union affirmed their shared commitment to protecting biodiversity at COP15.

“We are condemned to be able to find solutions together, because these problems are just too big for any single country or region,” said Steven Guilbeault, Canada’s Minister of Environment and Climate Change, in a conversation with Virginijus Sinkevičius, the European Commission’s Commissioner for the Environment, Oceans and Fisheries, hosted by Canada’s National Observer.

The Global Seed Vault, which is operated by the Norwegian government and a German nonprofit called the Crop Trust, is part of a broader network for seed storage. About 1,750 gene banks scattered across the globe hold the genetic codes to the world’s crops, both past and present, in the form of seeds or other plant tissues called germ plasm.

Together, these facilities contain about 7.4 million types of germ plasm, according to the UN's food and agriculture agency.

Preserving living crop genotypes in gene banks means plant breeders can tap into that diversity to create new, resilient crops. "If we only have one type of wheat and we want to make a new wheat, it's very difficult," said Axel Diederichsen, a researcher for Agriculture and Agri-Food Canada, who works at Canada's plant gene bank, in Saskatoon. "But if we have a collection with diverse wheat, then we can make crosses."

But gene banks are fallible. Anything from a dropped envelope to a natural disaster can threaten the preservation of seeds in gene banks. To mitigate this, gene banks can store duplicates of their seeds in the Svalbard vault. The vault currently hosts 5,947 plant species, many of which no longer grow on this earth, from 91 gene banks, according to its website. With each new deposit, the vault's library grows richer.

The Global Seed Vault is proof of the power of global cooperation on biodiversity — and it's an initiative Canada and the EU have championed since the beginning. When the vault was first opened in 2008, then President of the EU José Manuel Barroso stood beside the then Prime Minister of Norway, then UN FAO Director-General and other dignitaries to place the first seeds. European nations have deposited hundreds of thousands of seeds in the years since. Likewise, today, Canada has about 32,000 envelopes in Svalbard, each containing about 200 seeds, to grow crops like barley, oat and wheat, Diederichsen said.

The vault's value has already been tested. In 2015, after Syria's bloody civil war forced an important gene bank in Aleppo to relocate to Beirut, researchers retrieved more than 100,000 seed samples from the Arctic to replant in the new facility.

At 78 degrees N, Svalbard's chilly climate and thick permafrost make it a comfortable home for the world's seeds. When seeds are frozen, they can stay alive for centuries, Asdal said. The mountain permafrost has a stable temperature of between -3 and -4 C, and the vault uses artificial cooling to keep the seeds at an icy -18C. But even if the cooling system were to fail, the seeds would stay frozen, Asdal said.

This so-called doomsday vault isn't immune to climate change. Rapidly rising temperatures are causing the permafrost to thaw. After an unusually warm winter in 2017, a flood of meltwater breached the vault. No seeds were harmed, but the scare prompted the Norwegian government to spend about \$30 million fortifying the vault.

Despite the existential threats Svalbard is facing — from melting glaciers, to avalanches, to landslides — the Global Seed Vault is safe, Asdal assures, though it may need to use a bit more electricity to keep things cool as the planet warms.

Still, the world will need to lean on the genetic resources in the vault and other gene banks as the climate crisis accelerates, to replant crops that are destroyed in major weather events, and to breed new, adaptive plant varieties. Our food security depends on it.