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The entrance of the Global Seed Vault, which is close to Longyearbyen on the Norwegian island of Svalbard. (Dean C.K. Cox for the International Herald Tribune)

# In Norway, Global Seed Vault guards genetic resources

By Elisabeth Rosenthal

Published: February 28, 2008

**LONGYEARBYEN, Norway:** With plant species disappearing at an alarming rate, scientists and governments are creating a global network of plant banks to store seeds and sprouts - precious genetic resources that may be needed for man to adapt the world's food supply to climate change.

This week, the flagship of that effort, the Global Seed Vault, received its first seeds here - millions of them. Bored into the middle of a snow-topped Arctic mountain, the seed vault has as its goal the storing of every kind of seed from every collection on the planet. While the original seeds will remain in ordinary seed banks, the seed vault's stacked gray boxes will form a backup in case natural disaster or human error erase the seeds from the outside world.

The seed vault is part of a far broader effort to gather and classify information about plants and their genes. In Leuven, Belgium, scientists are scouring the world for banana samples and cryopreserving their shoots in liquid nitrogen before they become extinct. A similar effort is under way in France on coffee plants. A number of plants, most from the tropics, do not produce seeds that can be stored.

For years, a hodgepodge network of seed banks has been amassing seed and shoot collections. Labs in Mexico banked corn species. Those in Nigeria banked cassava.

These scattershot efforts are being consolidated and systematized, in part because of better technology to preserve plant genes and in part because of rising alarm about the trajectory of climate change and its impact on world food production.

## Multimedia



Photographs  
A safe haven for seeds  
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"We started thinking about this post-9/11 and on the heels of Hurricane Katrina," said Cary Fowler, president of the Global Crop Diversity Trust, the nonprofit group that runs the vault. "Everyone was saying, 'Why didn't anyone prepare for a hurricane before?'"

"Well, we are losing biodiversity every day - it's a kind of drip, drip, drip. It's also inevitable. We need to do something about it."

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This week, the urgency of the problem was underscored as wheat prices reached record highs and wheat stores dropped to the lowest level in 35 years. Droughts and new diseases cut wheat production in many parts of the world.

"The erosion of plants' genetic resources is really going fast," said Rony Swennen, head of crop biotechnics at the Catholic University of Leuven, who has cryo-preserved half of the world's 1,200 banana varieties. "We're at a critical moment, and if we don't act fast we're going to lose a lot of plants that we may need."

The United Nations International Treaty on Plant Genetic Resources, ratified in 2004, created a formal global network for banking and sharing seeds, as well as studying their genetic traits. Last year, its database received thousands of new seed varieties.

A well-organized system of plant banks could be crucial in responding to climate crises because it could identify genetic material and plants strains that are better able to cope with a changed environment. At the Global Seed Vault, hundreds of grey boxes containing seeds from Syria to Mexico were being moved this week into a freezing vault to be placed in suspended animation. Collectively they harbor a vast range of characteristics, including the ability to withstand drier, warmer climate.

Climate change is expected to bring new weather stresses as well as new plant pests into agricultural regions. Heat-trapping carbon dioxide emissions will produce not only global warming but also an increase in extreme weather events, like floods and droughts, the Intergovernmental Panel on Climate Change concluded.

Already, three-quarters of biodiversity in crops has been lost in the last century, according to the UN Food and Agriculture Organization. Eighty percent of corn varieties that existed in the 1930s no longer exist today, for example. In the United States, 94 percent of peas are no longer grown.

Seed banks have operated for decades, but many are based in agricultural areas and few are as technologically advanced or secure as the Global Seed Vault. Earlier efforts had been regarded as resources for gardeners, scientists, farmers and food aficionados rather than a tool for human survival.

The importance and vulnerability of seed banks have become apparent in recent years. Centers in Afghanistan and Iraq were destroyed during conflicts by looters who were after the plastic containers that held the seeds. In the Philippines, a typhoon demolished the wall of a seed bank, destroying many samples.

In reviewing seed bank policies a few years ago, experts looked at the banks in a new light, said Fowler of the Global Crop Diversity Trust. "We said, 'We may have some of the best seed banks in the world, but look at where they are: Peru, Columbia, Syria, India, Ethiopia, the Philippines.' So a lot of us were asking, 'What's plan B?' "

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The goal of the new global plant bank system is to protect the precious stored plant genes from the vagaries of climate, politics and human error. Many banks are now "in countries where the political situation is not stable and it is difficult to rely on refrigeration," said Swennen, the biotechnics expert. Seeds must be stored at minus 20 degrees Celsius (minus 4 Fahrenheit), and plant sprouts that rely on cryo-preservation must be far colder.

"We are inside a mountain in the Arctic because we wanted a really, really safe place that operates by itself," Fowler said.

Underground in Longyearbyen, just 1,000 kilometers, or 600 miles, from the North Pole, the seeds will stay frozen regardless of power failures. The Global Crop Diversity Trust is also funding research into methods for storing genetic material from plants like bananas and coconuts that cannot be stored as seed.

The vault was built by Norway, and its operations are financed by government and private donations, including \$20 million from the United Kingdom, \$12 million from Australia, \$11 million from Germany and \$6.5 million from the United States.

The effort to preserve a wide variety of plant genes in banks is particularly urgent because many farms now grow just one or two crops. They are particularly vulnerable to pests, disease and climate change.

Just as efforts to preserve biodiversity increase, economics encourages farmers to focus on fewer crops. But those seeds may contain traits that will prove advantageous in another place or another time. Scientists at Cornell University recently borrowed a gene from a South American potato to make potatoes that resist late blight, a devastating disease that caused the Irish potato famine in the 19th century.

"You need a system to conserve the variety so it doesn't go extinct," Fowler said. "A farmer may make a bowl of porridge with the last seeds of a strain that is of no use to him, and then it's gone."

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And potentially those are exactly the genes we will need a decade later."

Scientists are also working to learn more about the genetic characteristics of each banked seed - crucial knowledge that is often not recorded. Ultimately, plant breeders will be able to consult a global database to find seeds with genes suitable for the particular challenge confronting a region, like corn with a stalk that is strong enough to resist high winds or wheat that needs less water.

"The seed vault is adding a new dimension to an evolving global system," Sweeney said. "We should have done it sooner. But the technology and the global interest wasn't available."

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