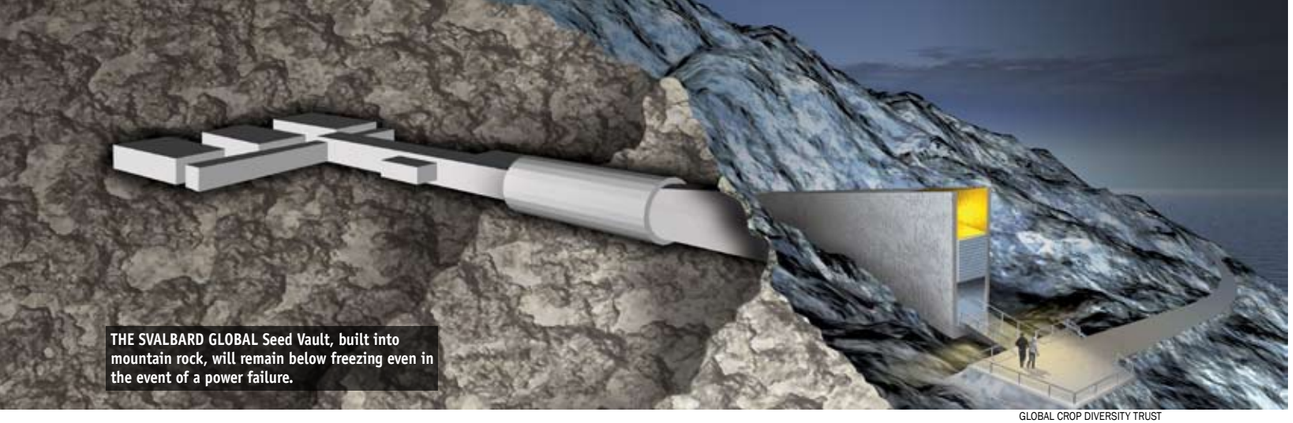

THE SVALBARD GLOBAL Seed Vault, built into mountain rock, will remain below freezing even in the event of a power failure.

GLOBAL CROP DIVERSITY TRUST

The ultimate backup

The Svalbard Global Seed Vault, designed as a last-resort backup for Earth's most important crops, has accepted its first samples, including more than 70,000 different types of rice

On Monday 21 January 2008, flight LH3134 left Manila, Philippines, for Oslo, Norway, counting more than 35 million grains of rice among its cargo. Headed not for Scandinavian dinner plates, these grains would continue on to the Norwegian island of Svalbard, north of the Arctic Circle, only 1,000 kilometers from the North Pole.

The seeds, from the International Rice Genebank of the International Rice Research Institute (IRRI), represented 70,180 samples of traditional and modern rice varieties and their wild relatives bound for the newly constructed Svalbard Global Seed Vault. In total, more than 200,000 crop varieties from Asia, Africa, Latin America, and the Middle East—drawn from seed collections maintained by centers of the Consultative Group on International Agricultural Research (CGIAR)—were shipped to Svalbard.

GP

ATTENDING THE OPENING of the Svalbard vault were (*left to right*) Dr. Zeigler, International Potato Center Board Chair Jim Godfrey, and Global Crop Diversity Trust Executive Director Cary Fowler.

IRRI's contribution included the first box placed in storage by Norwegian Prime Minister Jens Stoltenberg and 2004 Nobel Peace Prize Laureate Wangari Maathai during the vault's opening ceremony on 26 February 2008. Prime Minister Stoltenberg described the vault, which cost around US$9 million to build, as "a Noah's Ark for our biological heritage."

The facility—dubbed the "doomsday vault" by the world's media—is owned and administered by the Ministry of Agriculture and Food on behalf of the Kingdom of Norway and was established as a service to the world community. The Nordic Gene Bank will operate the facility and maintain a public online database of samples.

Constructed in the permafrost of the Svalbard mountains, the vault is designed to store duplicates of seeds from seed collections around the globe. Ruaraidh Sackville Hamilton, head of the International Rice Genebank, said that the new vault provides the "ultimate safety backup, located where all risks—political, geological, climatic—are extremely low."

He added, "For long-term survival, seeds need to be stored at low temperature. This is most economical in a place like Svalbard, where the ambient temperature is low and the insulation is high."

Further, he said, the risks faced by IRRI and Svalbard are not just independent but almost mutually exclusive. It is almost inconceivable that any risk could simultaneously destroy the two copies of the collection.

Svalbard Global Seed Vault: the numbers

The vault is located 120 meters into the rock, ensuring that the vault rooms will remain naturally frozen even if the mechanical cooling system fails or if external air temperatures rise because of climate change.

The distance from the front door of the portal building to the back of the vault is 145.9 meters. The width of each vault is 9.5–10 meters and the height is 6 meters. Each vault is approximately 27 meters long.

The vault has the capacity to store 4.5 million seed samples. Each sample contains an average of 500 seeds, so a maximum of 2.25 billion seeds can be stored. The seeds will be stored at minus 18 degrees Celsius in specially-designed four-ply foil packages that will be placed in sealed boxes. The low temperature and low moisture level will ensure that the seeds stay viable for decades, centuries, or even thousands of years.

IRRI itself holds the world's largest and most diverse collection of rice: nearly 110,000 accessions from 123 countries—around 20% of the total holdings of rice conserved in all genebanks around the world.

Rice agriculture depends on the vast diversity seen in the rice genebank. If a new rice disease appears, researchers can search the genebank for resistant varieties. The genes required to make rice more tolerant of drought, for example, exist within the varieties contained in the collection. The genebank contains the genetic diversity we need to respond to changes in climate, consumer expectations, agricultural technologies, and government priorities.

"Any new rice research project or rice breeding program typically starts with a scientist asking the seed bank to supply the types of rice required for their research," said Dr. Sackville Hamilton.

The immeasurable value of seed banks has been seen many times in the past. One notable example is the use of Cambodian rice varieties stored in IRRI's genebank to re-establish Cambodia's rice industry after it was devastated during years of civil strife in the 1970s, when a starving population ate the nation's seed stocks.

"The CGIAR collections are the 'crown jewels' of international agriculture," said Cary Fowler, executive director of the Global Crop Diversity Trust, which covered the costs of preparing, packaging, and transporting CGIAR seeds to the Arctic and will provide support for ongoing operations. "They include the world's largest and most diverse collections of rice, wheat, maize, and beans. Many traditional landraces of these crops would have been lost had they not been collected and stored in the genebanks."

DR. SACKVILLE HAMILTON helps load IRRI seeds in preparation for the flight to Svalbard.

JOSE RAYMOND PANALIGAN

IRRI Director General Robert Zeigler, who attended the vault opening, pointed out that Svalbard was neither built to make up for low standards nor an excuse to lower existing standards.

"If we assemble all the world's crop diversity in Svalbard and use that as an excuse to stop conserving it elsewhere, we'd be in an even worse situation, since then all available diversity could be destroyed by a single event," said Dr. Zeigler. "Moreover, the seeds in Svalbard are not accessible to anyone except the depositor. To realize the potential benefits of crop diversity, our farmers, scientists, and breeders must be able to use the seed easily. Seed banks such as IRRI's must therefore be maintained at locations around the world where they are most needed."

IRRI's collection is itself protected to the highest possible standards. The facility is raised above flood levels and is designed to withstand an earthquake of up to 7 on the Richter scale or a nuclear accident in a warship in Manila harbor 60 km away. IRRI has two levels of electricity backup—one set of generators for the whole Institute and one specifically for the genebank. To address the risk of equipment failure, the Institute maintains backup systems, for example, using two compressors for cooling, so that, if one fails, the second takes over. Spare parts of all key operational components are kept on-site.

"The high standard of construction and protection was confirmed during the devastating Typhoon Milenyo of October 2006, which caused severe damage to the Philippine national seed bank situated a few kilometers away but left our facility unscathed," said Dr. Sackville Hamilton.

Despite this, Dr. Sackville Hamilton cautioned that it is impossible to protect against all threats, which is why Svalbard is one—but only one—of the essential elements of a global system for the efficient and effective conservation and use of crop diversity.

"For such an important collection, we have to take all risks, no matter how remote, into account," he said. "For example, news of political unrest is common in the capital city Manila, and in the southern island group Mindanao. Might this political activity one day escalate to threaten IRRI? It is unlikely but who knows? We are close to an inactive volcano, Makiling. Might this volcano one day erupt again? Might we suffer a force-10 earthquake one day? The evidence suggests not in the near future, but even expert volcanologists and seismologists cannot guarantee zero risk, and they cannot make long-term predictions."

Among the VIPs and dignitaries at the vault's opening, Eulogio "Tay Gipo" Sasi Jr., a 64-year-old Filipino rice farmer, represented the people without whom all the seeds in the world would be of little use. "I hope that the knowledge that goes with the seeds will not just be stored in ice," said Tay Gipo, addressing the international audience, "but further enriched by giving support to the work of farmers."

Making it happen

Preparing for the Svalbard opening involved an enormous amount of hard work by many people for many months. IRRI staff who made the shipment possible are listed below.

Flora de Guzman
Lydia Angeles
Imelda Boncajes
Nerissa Boonggaling
Priscila Cabral
Jane Carandang
Isabelita De Mesa
Minerva Eloria
Aurelio Gamba
Evangeline Gonzales
Patria Gonzales
Minerva Gulde
Emerlinda Hernandez
Carlos Huelma
Jose Ibabao
Ariel Javellana
Nora Kuroda
Melencio Lalap
Alicia Lapis
Juan Lazaro IV
Wilma Lumaybay
Yolanda Malatag
Gilbert Mamiit
Veronica Mangubat
Violeta Manila
Bernardo Mercado
Bogs Panaligan
Roniella Prantilla
Jacqueline Ragudo
Renato Reaño
Digna Salisi
Teresita Santos
Anthony Telosa
Liza Yonzon