Seeds for Future

Global Wild Plant Seed Vault

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**Information Paper submitted by Italy**

1. Summary

The purpose of this paper is to present the Seeds for Future (SFF) project within the framework of the Antarctic Treaty Consultative Meeting (ATCM) for establishing a Global Wild Plant Seed Vault in the Antarctic Plateau ice depth.

According to the *State of the World's Plants 2020*, the total number of known wild vascular plant species is about 350,000 but scientists say that 43.7% of all plant species (more than 150,000) are likely threatened with extinction. Several seed banks have been established in the World, preserving the germplasm of hundreds of thousand species. The rationale of preserving seeds of endangered plants in Antarctica lies in the possibility to recover extinct species in the event of the loss of germplasm stored elsewhere.

2. Background

Banking the world’s seeds will give an insurance policy against the extinction of plants in the wild and protects our botanical heritage for future generations.

Establishing a *Global Wild Plant Seed Vault* in Antarctica, the most reliable natural freezer, is an effort to secure the safe storage of seeds of the most threatened plant species in the world, contributing to the Global Strategy for Plant Conservation and tackling the challenges of food security, sustainable energy, loss of biodiversity and climate change.

The SFF project idea was launched in Italy and France in 2019. Its international dimension has grown with the declaration of support of the IUCN Species Survival Commission which “…*consider the proposal to be of utmost importance for the conservation of plant diversity and the future of our planet*”, and of national and international seed bank networks.

The international scientific community is now working to make it a global initiative in the coming years.

During the development of the project, a governance plan, agreed by the ATCM parties, is needed to contribute to the long-term storage of seeds of threatened wild plants in Antarctica, particularly to ensure this complies with the Antarctic Treaty and the Madrid Protocol.

3. Goals of the SFF project

The SFF project aims to:

* Collect seed lots of wild threatened plants from all over the world before their extinction.
* Store these seed lots on a long-term basis (possibly hundreds of years) for future generations of scientists and humanity in general.

The scientific feasibility of the proposal is guaranteed by the collaboration with international experts in seed cryobiology and cryopreservation, like Prof. Hugh W. Pritchard (Head of the Comparative Seed Biology Group, Millennium Seed Bank, Royal Botanic Gardens, Kew).

The goal of the SFF project is to ensure the safest cold storage of the seeds of wild threatened plants from all over the world collected for this project. Safe storage should be guaranteed for the longest possible periods, possibly up to several centuries.

4. Design of the seeds repository

To ensure optimal storage conditions for the seed lots, not only must the temperature be kept below zero, but temperature variations must also be avoided. For this reason, the SFF project will involve the storage of the seeds at approximately 10 metres depth. At this depth, the snow temperature corresponds to the mean annual temperature for any given site, preventing seasonal temperature variations (e.g. -56°C at Concordia Station).

For storing SFF, here we propose the ice caves (or balloon caves) under experimental tests in Concordia Station (see Figure 1). This concept has a low environmental impact during both construction and decommissioning. The ice caves are obtained in approximately seven working days by putting thin layers of snow (using a snowblower) over an inflatable balloon that is deflated and removed once the roof is solid, leaving the ice cave. Initially, the access to these caves could be via a slope that will be buried once the cave closed, and then via trap doors prepared in the upper part during construction.

The ice cave needed is about 5 m in diameter and will host one or two 20ft ISO intermodal containers with a volume of about 33 m3 each, equipped with shelves for long-term storage. Seeds repositories should have a storage capacity of up to 80,000 seed lots. Seeds safe storage at such a low temperature will be guaranteed using sealed, unbreakable air-tight cryogenic PTFE containers of various dimensions preserved in sealed steel boxes.

As the life span of an ice cave cannot be considered indefinite, this system would require that every 7-10 years the ice caves are rebuilt and the containers on sledges taken off the old ones and placed inside the new ones.

Such facilities are supposed to keep seeds safe for hundreds of years without human oversight with no need to access the stored seed lots, except in case of need for withdrawal.



*Figure 1. A pilot ice cave built close to Concordia (pictures by Rocco Ascione, ENEA).*

5. Final remarks

What precedes is an introductory presentation of the Seeds for Future project. Italy reserves to present the next ATCM in 2022 with a working paper containing all relevant details of this initiative in order to obtain the necessary guidance from ATCM and CEP.

Relevant publications

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