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Ex Situ Conservation.

Ex situ conservation means literally, "off-site conservation". It is the process of protecting an endangered species of plant or animal outside its natural habitat; for example, by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans.

The best method of maximizing a species chance of survival is by relocating part of the population to a less threatened location. It is extremely difficult to mimic the environment of the original colony location given the large number of variables defining the original colony (microclimate, soils, symbiotic species, absence of severe predation, etc.). It is also technically challenging to uproot (in the case of plants) or trap (in the case of animals) the required organisms without undue harm.

The ex-situ conservation can be done by some of the following methods:

Zoos and botanical gardens-are the most conventional methods of ex situ conservation, all of which house whole, protected specimens for breeding and reintroduction into the wild when necessary and possible. These facilities provide not only housing and care for specimens of endangered species, but also have an educational value. They inform the public of the threatened status of endangered species and of those factors which cause the threat, with the hope of creating public interest in stopping and reversing those factors which jeopardize a species' survival in the first place. They are the most publicly visited ex situ conservation sites.

Endangered plants may also be preserved in part through germplasm banks. The term seedbank sometimes refers to a cryogenic laboratory facility in which the seeds of certain species can be preserved for up to a century or more without losing their fertility

Seed bank:

A seed bank preserves dried seeds by storing them at a very low temperature. Spores and pteridophytes are conserved in seed banks, but other seedless plants, such as tuber crops cannot be preserved this way. The largest seed bank in world is the Millennium Seed Bank housed at the Welcome Trust Millennium Building (WTMB), located in the grounds of Wakehurst Place in West Sussex, near London.

A seed bank stores seeds as a source for planting in case seed reserves elsewhere are destroyed. It is a type of gene bank. The seeds stored may be food crops, or those of rare species to protect biodiversity. The reasons for storing seeds may be varied. In the case of food crops, many useful plants that were developed over centuries are now no longer used for commercial agricultural production and are becoming rare. Storing seeds also guards against catastrophic events like natural disasters, outbreaks of disease, or war.

Depending on the species, seeds are dried to suitably low moisture content. Typically this will be less than 5%. The seeds then are stored at -18°C or below. Because seed DNA degrades with time, the seeds need to be periodically replanted and fresh seeds collected for another round of long-term storage.

Challenges:

Stored specimens have to be regularly replanted when they begin to lose viability.

Only a limited part of the world's biodiversity is stored.

It is difficult or impossible to store recalcitrant(Becomes non viable during preservation) seeds.

Seed banks carry a cataloguing and data management burden. The seed banks must document the plant's identity, sampling location, seed quantity, and viability state. Other information, such as farming systems in which the crops were grown, should also be available to future farmers.

Facilities are expensive for Third World countries which contain the most biodiversity.

Power would have to be sustained in order to keep the seeds at -18 Celsius, which would be very difficult in an apocalyptic scenario unless linked to an automated power plant that uses solar panels/hydroelectricity/ another source of power.

Cryo bank:

In this technique, a seed or embryo is preserved at very low temperatures. It is usually preserved in liquid nitrogen at -196°C. This is helpful for the conservation of species facing extinction.

Field gene banks

In field genebanks the plant genetic resources are kept as live plants that undergo continuous growth and require continuous maintenance. They are often used when the germplasm is either difficult or impossible to conserve as seeds (i.e. when no seeds are formed, seeds are recalcitrant or seed production takes many years, as for many tree species) or the crop is reproduced vegetatively.

Advantages

Field genebanks provide an easy and ready access to the plant genetic resources, for characterization, evaluation or utilization, while the same material conserved in the form of seeds, in vitro or cryo must be germinated or regenerated and grown before it can be used. They are also useful for conserving vegetatively propagated genotypes that commonly produce variants (genetic variation) since these can be more easily identified and rouged out in the field than in vitro.

Disadvantages

Field genebanks however, are generally more expensive to maintain, requiring more labour, more inputs and more space (land) than other methods of conservation. They also have higher levels of risk from natural disasters and adverse environmental conditions like drought, floods or attacks from pests and diseases.

Practical considerations

Maintaining plants in field genebanks is costly and risky and this method of conservation is usually used when there are no available alternatives or the storage period of other alternatives is very short and not practical. Field genebanks are mostly used for the conservation of clonal crops, often complementary to other conservation methods such as in vitro and cryo banks. Field genebanks are particularly sensitive to germplasm health issues and regular monitoring and testing together with application of disease control measures is essential to maintain plants free of diseases. Although field genebanks may not be the most secure method of germplasm conservation, often they are the only practical and cost effective way to conserve germplasm of clonal crops, especially when resources and skills are limiting.

When field genebank conservation is the only viable alternative, careful planning and field management can help to mitigate the risks.