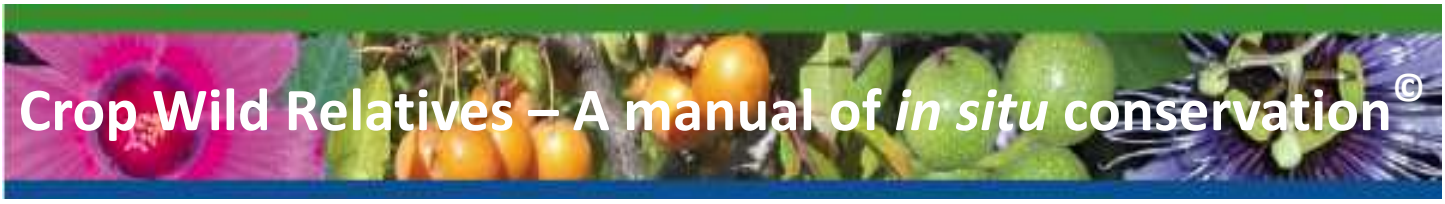


Crop Wild Relatives – A manual of *in situ* conservation©

What do we mean by *in situ* conservation of CWR?

History, purpose and intended benefits of in situ conservation.

THE MESSAGE:

Confusion still remains over the definition of, and implementation methods for, *in situ* conservation, even among the conservation and the agrobiodiversity communities.

The international framework for CWR conservation

The Convention on Biological Diversity (CBD) addresses *in situ* conservation through Article 8 which promotes: '**…** *the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties*'.

Further, **the CBD's Global Strategy for Plant Conservation (GSPC)** focuses on *in situ* conservation in Target VII, 60% of the world's threatened species conserved *in situ,* and Target VIII, 10% of threatened plant species included in recovery and restoration plans.

The Global Plan of Action (GPA) on Plant Genetic Resources for Food and Agriculture[1] presents a global strategy for the conservation and sustainable use of plant genetic resources (PGR), specifically recognizing the need to promote *in situ* conservation of CWR and wild plants for food production (under Priority Activity Area 4).

The activities of **the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)** relevant to *in situ* conservation are (under Article 5) to:

- **Survey** and inventory PGR for food and agriculture;
- **Promote** *in situ* conservation of CWR and wild plants for food production, including in protected areas;
- **Monitor** the maintenance of the viability, degree of variation, and the genetic integrity of collections of PGR for food and agriculture.

1 - FAO (1996), 'Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture and the Leipzig Declaration', adopted by the International Technical Conference on Plant Genetic Resources, Leipzig, Germany, 17-23 June 1996, Food and Agriculture Organization of the United Nations.

AIMS OF *IN SITU* CONSERVATION

In situ conservation primarily focuses on:

- the conservation of natural habitats, notably protected areas and other kinds of reserves, and
- the conservation, maintenance or recovery of viable population of species in their natural habitats.

In the case of CWR, emphasis is on the conservation of genetic traits of potential use in plant breeding. The long-term goal of CWR *in situ* conservation is **to protect, manage and monitor selected populations in their natural habitats to ensure natural evolutionary processes are maintained, allowing new genetic variation to be generated for adaptation to changing environmental conditions.**

Specific goals of the *in situ* conservation of CWR

- Ensure continued access to populations for research and availability of germplasm.
- Ensure availability of material of target species/ populations for use by local people.
- Selection for yield potential.
- Conserve species which cannot be regenerated outside their natural habitats.
- Enable some degree of conservation of associated species which may or may not be of known economic value and are of importance for a maintaining a healthy ecosystem.
- Minimize human threats to genetic diversity and support actions that promote such diversity in target populations[2].
- Minimize the risk of genetic erosion from demographic fluctuations, environmental variation and catastrophes[2].

2 - Iriondo, J.M. and De Hond, L. (2008) 'Crop wild relative *in situ* management and monitoring: The time has come,' in Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J.M., Dulloo, M.E. and Turok, J. (eds), *Crop Wild Relative Conservation and Use*, pp 319–330, CAB International, Wallingford, UK.

Crop Wild Relatives – A manual of *in situ* conservation©

TYPES OF *IN SITU* CONSERVATION

- Conservation of natural or semi-natural ecosystems in reserves or protected areas
- Conservation of agricultural biodiversity, including entire agroecosystems and the maintenance of domesticates (on-farm)
- Conservation and maintenance of target species in their natural or semi-natural habitats
- Genetic conservation
- Species recovery programmes
- Habitat restoration

CWR and protected areas

Species living in protected areas are somewhat protected given the nature of the reserve; however, without effective management, populations of target species in these areas are at risk as habitats are threatened by population pressure or movements, deforestation, the increasing demand for land and by the effects of climate change.

Many CWR are already threatened and the numbers are certain to increase under conditions of global change; monitoring efforts must increase as the absence of any management intervention to counter the species threats will compromise long-term survival.

In situ conservation of exploited species

Many species targeted for *in situ* conservation are subject to exploitation due to their economic value, such as wild fruit trees, medicinal and aromatic plants. The conservation objective should not only be to guarantee that species continue to evolve as natural viable populations, but also to sustain the use of the species for the benefit of various stakeholders.

ECONOMIC AND SOCIAL CONSIDERATIONS OF *IN SITU* CONSERVATION

The benefits and importance of CWR conservation are often not obvious to either the general public or to local stakeholders. Preserving large areas of land for the conservation of species whose economic potential is uncertain or difficult to perceive is often hard to justify. The involvement and support of local communities is critical for the successful implementation of *in situ* conservation activities.

CONSERVATION STRATEGIES

On-farm conservation

In situ conservation on-farm, or 'on-farm conservation', is: 'the continuous cultivation and management of a diverse set of populations by farmers in the agroecosystems where a crop has evolved'[3]. It involves entire agroecosystems, including immediately useful species (such as cultivated crops, forages and agroforestry species), as well as their wild and weedy relatives growing in nearby areas.

3 - Bellon, M.R., Pham, J.L. and Jackson, M.T. (1997) 'Genetic conservation: A role for rice farmers' in Maxted, N., Ford-Lloyd, B.V. and Hawkes, J.G. (eds) *Plant Genetic Conservation: The In Situ Approach*, pp 263–289, Chapman and Hall, London, UK.

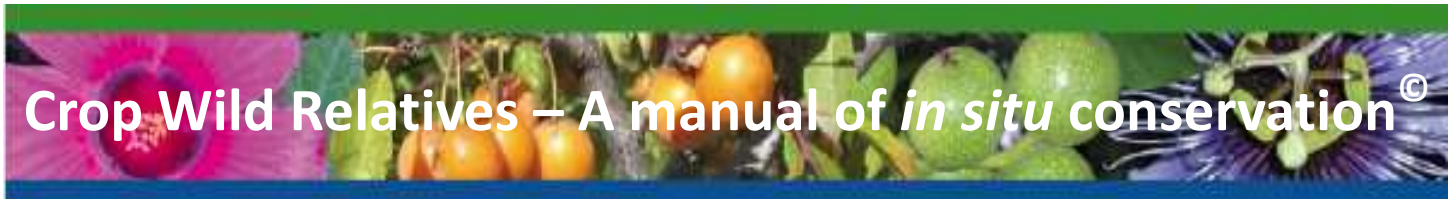
Active conservation *versus* Passive conservation

Passive conservation:

Assumes that if a species occurs within a protected area then, provided the area is adequately managed, the survival of the species/populations is likely without further intervention or management action.

Active conservation:

Requires positive action to promote the sustainability of the target species and maintenance of the natural, semi-natural or artificial (e.g. agricultural) environment.



Crop Wild Relatives – A manual of *in situ* conservation©

The 'ecosystem approach'

Conservation practitioners now recognize that integrative methods for identifying conservation strategies should be utilized. Depending on the circumstances, certain scientific and social techniques or approaches (such as *in situ*, *ex situ*, *inter situs*, reintroduction, population reinforcement) should be adopted. The CBD supports this concept and promotes the **ecosystem approach,** which aims to put people and their natural resource use practices at the centre of decision-making and to seek a balance between the conservation and use of biological diversity in areas where there are both multiple resource users and important natural values[4].

4 - Masundire, H. (2004) Preface in Shepherd, G., *The Ecosystem Approach: Five Steps to Implementation*, IUCN – The World Conservation Union, Gland, Switzerland and Cambridge, UK.

ECOSYSTEM APPROACH VS. *IN SITU* CONSERVATION

- More human interventions are associated with *in situ* approaches
- Ecosystem approaches are more process- or function-orientated
- *In situ* conservation may be more species-specific and species-centred
- *In situ* approaches are geographically more restricted than ecosystem-based approaches
- Ecosystem approaches primarily conserve habitats, often with little or no knowledge of the genetic resources present in those habitats.

In practice, the conservation of species *in situ* depends on identifying habitats in which they occur and ensuring the protection of both the habitat and the species. Thus, although *in situ* species conservation is a species-driven process, it also involves habitat protection.

Source - Poulsen, J. (ed.) (2001) *Genetic Resources Management in Ecosystems*, Report of a workshop organized by CIFOR for the SGRP CIFOR, Bogor, Indonesia, 27–29 June 2000. Centre for International Forestry Research (CIFOR), Bogor, Indonesia for CGIAR SGRP, Rome, Italy, http://www.cifor.cgiar.org/publications/pdf_files/grme.pd

'Course' and 'Fine filter' approaches

The conservation of genes, populations and species is known as the **fine filter** approach, while the conservation of communities and habitats is known as the **coarse filter** approach.

Using a coarse filter for ecosystems management assumes that if functioning ecological communities remain intact, the species living in those communities will thrive. However, this approach allows some species to be neglected and does not address conservation needs of target species.

Complementary conservation strategies

Complementary strategies include both *in situ* and *ex situ* approaches, which may be necessary in cases where species are highly threatened and/or highly valuable. *Ex situ* conservation involves the conservation of PGR outside their natural habitats; this can act as a back-up in case *in situ* measures are unsuccessful and the target species becomes

Crop Wild Relatives – A manual of *in situ* conservation©

Genetic/Genetic reserve conservation

The term **genetic conservation**[5] is often used for the conservation of CWR[6] and a common approach is referred to as **genetic reserve conservation.** The focus is on the conservation and utilization of genetic diversity.

A **genetic reserve** (or gene management zone) is a protected area managed in such a way as to maintain suitable ecological conditions and the conservation needs of one or more target species.

5 - Frankel, O.H. (1974) 'Genetic conservation: our evolutionary responsibility', *Genetics* vol 78, pp 53–65. (The term genetic conservation was apparently introduced By Erna Bennett according to; Fowler, C. and Mooney, P.R. (1990) *Shattering: food, politics, and the loss of genetic diversity*, University of Arizona Press, Tuscon, AZ, USA.)

6 - It also covers the conservation of traditional crop varieties (on-farm) as well as wild species (Frankel 1974).

Specific actions that apply to CWR[7] are:

- Minimize the risk of genetic erosion from demographic fluctuations, environmental variation and catastrophes.
- Minimize human threats to genetic diversity.
- Support actions that promote genetic diversity in target populations.
- Ensure access to populations for research and plant breeding.
- Ensure availability of material of target populations that are exploited and/or cultivated by local people.

7 - Iriondo, J.M. and De Hond, L. (2008) 'Crop wild relative *in situ* management and monitoring:The time has come,' in Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J.M., Dulloo, M.E. and Turok, J. (eds), *Crop Wild Relative Conservation and Use,* pp 319–330, CAB International, Wallingford, UK.

FORESTRY SPECIES: A SPECIAL CASE

The conservation of forest genetic resources is often considered a special case and has tended to follow a wider set of approaches[7], including setting aside areas of natural forest habitat as reserves, as well as the regeneration or rehabilitation of forests affected by logging or depleted through other causes, both stochastic and human-induced.

Different approaches reflect the nature and special characteristics of trees and their economic role. For example, trees often contain greater genetic diversity than other species [8, 9]; there may be poor differentiation with respect to nuclear markers; there is generally high differentiation among populations for adaptive traits; and individuals often have high longevity.

8 - Hattemer, H.H. (1997) 'Concepts and requirements in the conservation of forest genetic resources', in Valdés, B., Heywood, V.H., Raimondo, F.M. and Zohary, D. (eds), *Conservation of the Wild Relatives of European Cultivated Plants, Bocconea*, vol 7, pp 329–343.

9 - Müller-Starck, G. (1995) 'Protection of genetic variability in forest trees', *Forest Genetics*, vol 2, pp 121–124.

CWR Project, Sri Lanka/A. Wijesekar