

# Global strategy for the conservation of *Brassica* genetic resources: summary for ITPGRFA stakeholders

This document is a concise summary of the [Global Strategy for the Conservation of \*Brassica\* Genetic Resources](#) (Allender and Giovannini 2023). This summary supports decision making by the stakeholders of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) by providing evidence-based information in an accessible format.

**Annex I crops:** *Brassica oleracea* L., *Brassica napus* L., *Brassica rapa* L., *Brassica juncea* (L.) Czern., *Brassica nigra* (L.) W. D. J. Koch and *Brassica carinata* A. Braun

## Composition and gaps in *ex situ* collections

It is estimated that over 85,000 accessions of *Brassica* germplasm are held globally in 150 institutions. However, more than 80% of these are concentrated in 17 collections. These accessions consist of 36 species (excluding interspecific hybrids), although the vast majority (94% of the total) represent the six most commonly cultivated species: *Brassica oleracea*, *B. napus*, *B. rapa*, *B. juncea*,

*B. nigra* and *B. carinata*. Generally, *Brassica* crops are well represented across the global collections of PGR; however, concerns and gaps do exist and require careful consideration in terms of how to address them. The coverage of crop species reflects current agricultural importance, with *B. nigra* being less represented in global collections as its cultivation has not been as widespread as that of other species. Some identified gaps in the *ex situ* coverage of *Brassica* crop wild relatives are: *Brassica assyriaca*, *B. beytepeensis*, *B. cadmea*, *B. deserti*, *B. setulosa*, *B. somalensis*, *B. taurica* and *B. trichocarpa*. *B. drepanensis* and *B. hilarionis* are classified as Endangered by the International Union for Conservation of Nature and Natural Resources (IUCN) and have a relatively low number of conserved accessions.

Key metrics	Data source	Value	%
Estimated global number of accessions <i>ex situ</i>	Genesys (2021), WIEWS (2021), and Survey <sup>1</sup> (2022)	85,474	
Estimated global number of accessions <i>ex situ</i>	Survey (2022)	51,789	
Estimated global number of accessions notified as available in the MLS	Genesys and WIEWS (2021)	29,296	34%
Estimated global number of accessions notified as available in the MLS	GLIS portal (2024)	14,527	17%
Accessions with DOI	GLIS portal (2024)	15,149	18%
Number of accessions safety duplicated at Svalbard Global Seed Vault	SGSV web portal (2024)	13,854	16%
Number of samples distributed per year nationally	Survey (2022)	6,134	
Number of samples distributed per year internationally	Survey (2022)	1,509	
Passport data completeness index: median value in Genesys ( Range 0-10)	Genesys (2023)	6.1	

<sup>1</sup>Responses to the online survey conducted in 2022 were received from 26 genebanks.

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## Routine operations and quality management system

Most collections are held in long- or medium-term storage and packaged appropriately to maximize seed longevity. The survey results indicated that 58% of surveyed genebanks keep 100% of their collections under long-term storage conditions. A further five collections maintain part of their collections under long-term conditions. Eight respondents indicated that their collections are held under medium-term storage conditions. Regeneration was identified as a key challenge, either in terms of staff, financial or physical resources, or due to the biological nature of the material conserved.

Regeneration was identified as a key challenge, either in terms of staff, financial or physical resources, or due to the biological nature of the material conserved. Another challenge is the outcrossing nature and self-incompatibility of some *Brassica* crops (particularly *B. oleracea*). Regeneration procedures and facilities need to be able to handle a sufficient number of individual plants to maintain intra-accession diversity, and to maintain the genetic integrity of each accession through avoiding cross-pollination between accessions. Regeneration is also linked intrinsically to safety duplication – sufficient, high-quality seeds must be available for duplicate samples. Therefore, supporting regeneration activities, particularly for germplasm that is otherwise poorly represented across global collections, is essential to improve the conservation and availability of *Brassica* germplasm.

## Safety duplication

The majority of survey respondents (60%) indicated that their collection is fully or partly safety duplicated elsewhere. Several collections linked regeneration to safety duplication. They reported that they use subsamples of regenerated seeds as a safety duplicate, ensuring that the duplicate samples have high viability and the longest possible lifespan. Therefore, challenges to regeneration affect also safety duplication.

## Crop descriptors

Various descriptor lists are used, but not all descriptors on each list are scored every time. Agreeing on a key minimum set of descriptors that are always scored would allow comparisons among datasets.

## Documentation and information systems

Most collections reported the use of software to manage collection data, with 85% reporting that collection data are at least partly publicly available to users. Some collections reported the need to upgrade data management software, with two collections recognizing the need but not having the resources to do so. The most frequently used software is GRIN-Global, which is used by 38% of the surveyed collections. Only one collection reported having no database. It is essential that support is continued for the further development of GRIN-Global, including direct support to users provided via the helpdesk, and training to assist organizations to install the system and migrate their data into it. Generally, discussions in the workshop revealed a gap between the requirements of some collections, particularly smaller ones, and the technical capability to install and manage such packages. There is a need to be able to share experiences with peers and exchange information on best practices.

## Distribution and obstacles to use

The majority of collections (73%) indicated that they use the SMTA, accounting for over 31,000 *Brassica* accessions in the Multilateral System (MLS). A similar estimate of accessions in the MLS was obtained using Genesys and WIEWS data. The survey responses indicated that, over the past three years, on average over 7,600 samples of cultivated accessions had been distributed per year (80% nationally and 20% internationally). Ten survey respondents expressed concerns about having procedures in place to deal with relevant phytosanitary regulations relating to seed distribution.



## Partnerships and networks

Some genebanks currently operate in partnership with breeding companies, which contribute toward regeneration as an “in-kind” form of support. A regional network is the Brassica Working Group of the European Cooperative Programme for Plant Genetic Resources (ECPGR). The Group’s 75 members represent 34 countries and have a range of roles, collection curators, researchers, plant breeders and policy experts.

## Recommendations and priorities

- 1. Support for regeneration and long-term storage.** Future financial assistance should be targeted at collections that are unable to support sufficient regeneration activity, prioritizing unique and important materials. Other means of achieving this objective include networking activities among genebanks.
- 2. Identification of unique materials for priority conservation.** This activity is likely beyond the scope of individual collections and will require a joint approach through a program of activities carried out in parallel with routine collection maintenance. This work will need a collaborative approach involving collection managers, experts in genotyping and bioinformatics and a coordinating project secretariat.
- 3. Documentation – making information available to users and managers.** There is a need to be able to share experiences with peers and exchange information on best practices. It is essential that support is continued for the further development of GRIN-Global, including direct support to users provided via the helpdesk, and training to assist organizations to install the system and migrate their data into it.

- 4. Crop wild relatives.** Understanding which accessions are available for distribution at a global level, and which require regeneration or re-collection, is an essential step to ensure optimal conservation of these species. This would include an assessment of intra-species diversity facilitated by genetic/genomic analysis to ensure that sufficient populations are sampled to conserve species genetic diversity.
- 5. A global *Brassica* PGR conservation network.** A global network would offer wider opportunities for cooperation and improvements to conservation effectiveness and efficiency. This network could be formed by inviting collection holders to join the existing European network. Such a network would ideally include a range of other commercial and academic organizations with interests in *Brassica* species. These organizations may be able to provide expertise or resources to address regeneration, as well as genetic or phenotypic characterization and other issues. The network may also be able to address and interact with phytosanitary authorities to support the use of collections while managing risk appropriately.

## Bibliography

Allender, C. and Giovannini, P. 2023. Global strategy for the conservation of *Brassica* genetic resources (Version 2). Zenodo. <https://doi.org/10.5281/zenodo.8225200>

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