

Global strategy for the conservation and use of genetic resources of selected millets: summary for ITPGRFA stakeholders

Pearl millet, Zimbabwe. Photo: Michael Major



This document is a concise summary of the [Global strategy for the conservation and use of genetic resources of selected millets](#) (Bramel et al. 2022). 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

Pearl millet: *Cenchrus americanus* (L.) Morrone

Finger millet: *Eleusine coracana* (L.) Gaertn.

Foxtail millet: *Setaria italica* (L.) P. Beauv.

Non-Annex I crops

Proso millet: *Panicum miliaceum* L.

Barnyard millet: *Echinochloa crus-galli* (L.) P. Beauv. and *Echinochloa colona* (L.) Link

Teff: *Eragrostis tef* (Zucc.) Trotter

Fonio: *Digitaria exilis* Stapf. and *Digitaria iburua* Stapf.

Little millet: *Panicum sumatrense* Roth. ex. Roem & Schult.

Kodo millet: *Paspalum scrobiculatum* (L.)

Foxtail millet: *Setaria italica* (L.) P. Beauv.

International collections

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Center for Biosaline Agriculture (ICBA), International Livestock Research Institute (ILRI), Alliance Bioversity International and CIAT

Regional collections

South African Development Community Plant Genetic Resources Centre (SPGRC)

The global system for the conservation and use of millet crops

The global system for the conservation and use of millet crops consists of the following:

- local farmers who conserve the majority of the diversity of these crops;
- natural areas where the majority of the diversity of crop wild relatives (CWRs) is still conserved;
- one international genebank – ICRISAT – which conserves a large collection of millets;
- a few key national collection holders in the centers of diversity; and
- a few national collections outside of the centers of diversity conserving accessions that are duplicates of those held by others and that are conserved more securely and made more available to users.

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Composition and gaps in *ex situ* collections

Globally, about 60 institutions conserve more than 220,000 accessions of millet crops. Table 1 presents estimates¹ of the number of accessions conserved *ex situ* by crop. For all the millet crops, the composition of the collections conserved by the survey² respondents were characterized by a high proportion of unique local landrace accessions.

The strategy reports the results of gap analyses for pearl millet and finger millet, and recommends that a global conservation planning exercise be carried out to determine key priority sites that would be targeted for conservation through collection and detailed *in situ* conservation interventions, including the creation of genetic reserves for millet genetic resources.

The low number of CWR accessions is a concern, given their importance for future crop improvement and the fact that many are at risk in natural areas. The respondents from pearl millet production countries in West and Central Africa indicated that insecurity and difficulty in access are major constraints to collecting wild relatives in many areas.

Routine operations, regeneration, quality management system, safety duplication, and human and financial resources

About 70% of surveyed collections have no routine activities for seed health testing, seed number deter-

mination, regeneration or multiplication. Only 17% to 34% of accessions are regenerated. Overall, the survey highlighted a lack of quality management systems for key routine operations and problems related to the regeneration of accessions that are losing viability, and to the multiplication of seed for distribution. An estimated 20% of millet crop accessions are safety duplicated in the Svalbard Global Seed Vault. Genebanks are poorly resourced and are a low priority for donors and governments. The survey highlighted the dependence of respondents on project funding.

Documentation and information systems

There is limited availability of, and access to, accession-level information for users through searchable online platforms. Much of the genebank information and accession-level information has not been digitized or is available only within internal databases. Across all respondents and crops, 38% of accessions have been characterized for minimal traits, but the characterization data are available in a searchable database for only 11% of accessions.

Wider adoption of genebank information systems, such as GRIN-Global or others, will lead not only to increased monitoring and management efficiency for conservation, but also to greater online sharing of accession-level information. It will also allow for better backup of documentation and better linking of collections within the global system, which will enhance use and security of conservation efforts.

¹ Data from FAO-WIEWS retrieved in 2020

² The survey was conducted in 2020 with genebanks identified as holders of millet genetic resources. Staff from 24 genebanks completed the survey.

Table 1. Summary key metrics for selected millets. * = the figure includes wild relatives (Here defined as other species in the same genus)

| Crop | No. of collections globally ³ | Total no. of accessions globally (multiple sources) | Safety duplicated at SGSV (SGSV portal 2024) | Accessions with DOI (GLIS 2024) | Accessions notified as available in the MLS (GLIS 2024) | Accessions notified as available in the MLS in international collections (GLIS 2024) | Passport completeness index (Genesys 2024) |
|------------------|--|---|--|---------------------------------|---|--|--|
| Pearl millet* | 57 | 73,578 | 26,903 | 46,554 | 41,380 | 31,037 (75%) | 7.35 |
| Finger millet* | 49 | 43,862 | 11,314 | 10,563 | 9,190 | 7,563 (82%) | 6.55 |
| Foxtail millet* | 46 | 46,368 | 2,715 | 3,091 | 2,098 | 1,713 (82%) | 7.1 |
| Proso millet | 52 | 29,865 | 1,957 | 1,529 | 1,282 | 1,025 (80%) | 5.1 |
| Barnyard millet* | 34 | 8,920 | 858 | 1,597 | 1,358 | 1,283 (94%) | 6.95 |
| Kodo millet* | 13 | 4,398 | 657 | 1,776 | 1,324 | 717 (54%) | 6.85 |
| Little millet | 12 | 3,734 | 649 | 481 | 470 | 469 (99%) | 7.4 |
| Teff* | 21 | 8,305 | 378 | 1,665 | 649 | 516 (80%) | 4.55 |
| Fonio* | 13 | 1,170 | 167 | 1,430 | 1,051 | 263 (25%) | 4.15 |
| Total | | 220,200 | 45,598 | 56,736 | 50,582 | | |

³ The number of collections globally was estimated using information from FAO-WIEWS (2020), Genesys (2020), and Global Crop Diversity Trust. (2012a, 2012b), and information in Dwivedi et al. (2012)

Distribution and obstacles to use

About 50% of the surveyed genebanks conserving millets distribute internationally with an SMTA. International distribution is hampered by policy, costs of distribution and administrative complexity. The main users of millet crop collections tend to be nationally based researchers. International users are primarily genebank curators from other countries.

Partnerships and networks

ICRISAT is a CGIAR center with an international collection of millets and has taken the lead on actively engaging with partners for the crops they conserve. The French National Research Institute for Sustainable Development (IRD) continues to engage with countries that conserve fonio and pearl millet. Other regional networks include the Southern African Development Community Plant Genetic Resources Centre (SPGRC), which involves all collection holders for pearl millet and finger millet, and the European Cooperative Programme for Plant Genetic Resources (ECPGR) for European collection holders that conserve proso millet.

In situ and on-farm conservation

There is very little active on-farm management of millet landraces and practically no *in situ* conservation of millet wild relatives. Local landraces of millets are being displaced by more profitable crops and improved millet varieties. However, there have been some initiatives to promote the conservation of local millets. The strategy includes a summary of IUCN Red List assessments of CWRs of millets. Of the 142 taxa assessed, 72% are in the category of Least Concern, 6% Vulnerable, 8% Endangered and 4% Critically Endangered.

Strategic objectives

- Secure conservation of millet crop genetic resources for the long term by (a) addressing insecurity in *ex situ* conservation due to suboptimal routine operations, facilities and safety duplication; and (b) addressing risk to unique diversity conserved in farmers' fields and in natural areas.
- Increase the availability and exchange of germplasm by addressing constraints to distribution such as insufficient seed quantity, quality, and viability and policy bottlenecks.
- Increase the use of the conserved genetic diversity by (a) increasing available accession-level information, (b) increasing evaluation and genotyping, (c) establishing subsets of collections, and (d) increasing genebanks engagement with researchers and farmers.

Priorities

- Establish a global platform for the engagement of key collection holders and main users. It will allow *ex situ* collection holders and users to share experiences, collectively improve conservation practices, establish quality management systems protocols, offer each other capacity-building opportunities, and address the needs for safety duplication, adoption of genebank information systems, and sharing of accessions-level information that meets the needs of users. ICRISAT, as well as some of the key national collection holders, could initially convene this platform.
- Establish a global fund with a competitive grant scheme to increase resources for upgrades and secure conservation key national collection holders in the center of diversity.
- Enhance knowledge, conservation and use of the unique diversity of millet crops still found in the field or in natural areas: (a) Develop an advocacy plan to create enabling policies to promote and enhance the on-farm maintenance of millet genetic resources, (b) conduct systematic surveying and inventories of millet diversity in the fields and in the wild, and (c) conduct a global conservation planning exercise to determine key priority sites that would be targeted for *ex situ* and *in situ* conservation.

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