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

Photo: A. Chambers, University of Florida

This document is a concise summary of the Global Strategy for the Conservation and Use of Vanilla Genetic Resources (Bramel and Frey 2021). Its aim is to support decision-making by the stakeholders of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) by providing an evidence base on this genepool in an accessible format.

Crops covered by the strategy:
Vanilla planifolia Andrews, *Vanilla x tahitensis* J.W. Moore[1], and *Vanilla pompona* Scheide
These are not Annex 1 crops as of the time of writing.

Composition and gaps in *ex situ* collections

A global assessment of vanilla genetic resources, based on the FAO WIEWS[3], GBIF[4] and BGCI[5] databases, complemented by a targeted survey, highlights both the progress made and the significant gaps that remain in *ex situ* conservation of this important genus. The survey, conducted in 2020 and completed by 18 institutions in the Americas, Europe and the Indian Ocean, accounted for about 62% of all known accessions and is considered broadly representative of the global system, despite some key gaps, such as the absence of the Indian Institute of Spice Research.

Globally, some 1,946 accessions of *Vanilla* species are conserved at 221 institutions. However, reporting limitations in global *ex situ* databases may obscure the true picture of holdings worldwide and conservation efforts are uneven across taxonomic groups. More than three-quarters of all accessions belong to just six species: *V. planifolia*, *V.* × *tahitensis*, *V. pompona*, *V. odorata*, *V. insignis*, and *V. phaeantha*, all of which are in section *Xanata*. Many other species—over 60—are not conserved at all, particularly those in sections *Membranacea* and *Tethya*.

While some institutions maintain largely unique accessions, others hold material that is mostly duplicated elsewhere, raising concerns about the actual level of diversity represented. Over the past decade, respondents reported losing around 313 accessions, while acquiring more than 1,100 through field collection and exchange.

Table 1. Key metrics for vanilla. The data source indicates, in parenthesis, the year of data retrieval.

Key metrics	Data source	Value
Estimated global number of accessions conserved *ex situ*	Survey (2020), WIEWS (2020), GBIF (2020), BGCI (2020)	1,946[2]
Number of accessions in FAO-WIEWS	WIEWS (2025)	523
Number of accessions in Genesys	Genesys (2025)	134
Estimated global number of accessions in the MLS	GLIS portal (2025)	0
Accessions with DOI	GLIS portal (2025)	4

[1]Hybrid derived from *Vanilla planifolia* and *Vanilla odorata*
[2]This figure excludes 180 accessions identified solely as *Vanilla* sp. or *Vanilla* hybrid.
[3]FAO-WIEWS: World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture
[4]GBIF: Global Biodiversity Information Facility
[5]BGCI: Botanic Gardens Conservation International

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Conservation gaps are especially pronounced for wild species from Central and South America, which are essential sources for traits such as disease resistance and quality improvement. Also, leafless *Vanilla* species (subgenus *Xanata*, section *Tethya*), which may provide important traits such as drought tolerance and *Fusarium* resistance, remain severely underrepresented in *ex situ* collections.

Routine operations & quality management system

Survey results reveal that vanilla conservation faces serious challenges. Many field genebank sites are unsuitable for growth, and lack the staff and resources needed for proper management. *In vitro* culture is used by some institutions for both conservation and breeding, but it is limited by shortages of expertise, supplies, and protocols, and transferring plants from culture to the field remains difficult. Cryopreservation has potential but is rarely applied, and seed conservation is still at an early stage.

A major weakness in vanilla conservation is the absence of a common, coherent, and organized safety duplication strategy. Duplication within the system often occurs because some collections acquire a significant share of their material from other collections rather than directly from farmers' fields or wild populations. International duplication is rare and further constrained by regulations such as the Nagoya Protocol and CITES. Lessons from crops like banana and coconut demonstrate that global networks or international centers could provide more secure backup for vanilla diversity.

Most genebanks also lack written guidelines or standard operating procedures, and many collections were created for research or education rather than long-term conservation. In summary, the survey shows that the global system for conserving vanilla diversity is not secure, efficient, or resilient. None of the institutions involved meet FAO's recommended standards for conserving vegetatively propagated crops (FAO 2014). The lack of guidelines, operating standards, duplication strategies, and coordinated research makes the system vulnerable.

Documentation and Information systems

According to FAO's genebank standards (FAO 2014), all accessions should have complete passport data using FAO/Bioversity multi-crop descriptors. Survey results show that documentation of vanilla accessions falls short of this goal. Around 80% of respondents reported having taxonomic data, more than half have photos or passport data, and about one-third have phenotypic or genotypic information. Few of the respondents reported having a herbarium specimen or an illustration for their accessions. Where information exists, it is often incomplete across accessions.

Most institutions restrict access to accession-level data to internal staff, with only a few using searchable internal or external databases, and just one sharing data publicly on platforms like Genesys. Barcoding is rarely applied to manage accessions. This limited accessibility reduces opportunities for secure conservation and broader use of vanilla genetic resources.

Human and financial resources

Efficient and reliable conservation of vanilla diversity requires trained staff, adequate resources, land, facilities, equipment, and well-documented procedures. Survey results show that staff numbers in institutes ranged from fewer than one to six full-time equivalents, often including volunteers and students. Expertise and training were generally considered inadequate. Staff turnover was also a challenge, with past losses of trained personnel resulting in the loss of accessions.

Only four respondents reported having an annual allocation of resources for routine operations and facility upgrades, while most institutions relied heavily on project-based or uncertain funding. Few had recurrent budgets, and many reported stagnant or declining support. Routine operations often depended on volunteers, while some institutions covered costs through income-generating activities such as plant sales, tours, or private investors. No consistent donor support was identified.

This heavy reliance on short-term project funding creates insecurity for routine operations, increasing the risk of plant health issues, losses, and backlogs in propagation, characterization, and evaluation. It also limits investment in infrastructure, staff development, and the long-term security of genetic resource. Suggested solutions include lobbying governments for greater budget allocations and establishing a global competitive project fund to address urgent funding gaps, routine operational needs, and responses to natural disasters.

Distribution and obstacles to use

Only 12 of the 16 institutions that responded to the relevant survey question reported distributing their accessions. Of these, ten have distributed to users within the institute, eight have distributed nationally and six have distributed internationally.

Distribution to users in the past five years has been limited, with botanical gardens and academic researchers being the main recipients. A few institutions distributed frequently to farmers and farmer organizations.

Three main policy issues constrain international distribution. First, CITES lists vanilla species under Appendix II, requiring exemptions and certificates for trade. Second,

vanilla is not included in Annex I of the ITPGRFA, so exchanges must follow Nagoya Protocol procedures, which can be complex. Third, live plant material requires secure packaging, phytosanitary certification, and proper shipping, all of which are costly and time-consuming. While 64% of respondents reported having adequate distribution policies and procedures, others faced challenges such as unclear policies, high certification costs, and limited awareness of shipping rules. Restrictions often limited sharing to national entities, non-commercial uses, or recipients with prior permissions and proper certification. No institutions had formal systems in place to track how accessions were used.

Links to users

Collaboration and user engagement varied. Most respondents had partnerships with botanical gardens, universities, researchers, and occasionally farmers, NGOs, or private collectors. These partnerships supported research, training, germplasm evaluation, and local conservation. However, global networking remains weak. Existing collaborations are mostly regional, based on language and culture, such as French-speaking partnerships in the Indian Ocean and the Spanish-language vanilla network in Latin America. Events like the Mexican Orchid Meetings, Latin American vanilla congresses, and networks such as the Mexican Vanilla Network have strengthened regional collaboration.

Partnerships and networks

At the global level, vanilla has gained some visibility through the World Orchid Conference and specialized vanilla symposiums, but overall international coordination remains limited. Stronger global networks connecting collections, researchers, farmers, industry, and consumers would improve conservation and use of vanilla genetic resources.

Overview, recommendations and priorities

The conservation and use of vanilla involve:

- Local farmers in centres of diversity conserving mostly cultivated vanilla (*V. planifolia* and *V.* × *tahitensis*).
- Natural areas holding wild relatives of cultivated vanilla.
- Key *ex situ* collections: BRC Vatel (Réunion), CITRO (Mexico), INIFAP (Mexico), INSEFOR (Costa Rica), and the University of Florida, which have unique diversity and expertise in conservation and genomics, but limited support.
- Collections at universities and botanical gardens located outside the center of diversity.
- Smallholder producers in Madagascar, Indonesia, Uganda, Tahiti, and Papua New Guinea with limited genetic diversity.
- Private industry dependent on quality vanilla and interested in new sources.

Vanilla planifolia. Photo: Maren Botanik/Wikimedia

Overall, the global conservation of vanilla genetic resources is precarious. The most important cultivated species, *V. planifolia*, is relatively well represented in ex situ collections but still faces risks, whereas the majority of wild species are poorly conserved and urgently require attention. Strengthening *ex situ* collections with broader representation from farmers' fields, natural habitats and underrepresented regions, combined with a better understanding of taxonomy and wider sharing of genetic material, will be essential to reduce pressure on wild populations and secure the diversity of this economically and culturally important genus.

Recommendations and priorities

Three strategic areas are identified in the global strategy:

- **Secure long-term conservation**
  - Strengthen *ex situ* operations, facilities, safety duplication, and research.
  - Protect diversity in farmers' fields and natural areas.
  - Improve global engagement of conservers and users.
  - Promote greater advocacy and communication regarding vanilla conservation.
- **Increase germplasm availability and exchange**
  - Improve propagation and plant health protocols.
  - Remove policy and phytosanitary barriers.
  - Facilitate transparent distribution to users.
- **Enhance use of conserved diversity**
  - Provide online, accession-level information.
  - Conduct evaluation and genotyping, and share the results.
  - Establish core collections for research and breeding.
  - Strengthen engagement with researchers, farmers, and industry.
  - Implement access and benefit-sharing protocols.

Three priority actions have been identified as initial steps in implementing the strategy:

- **Global Workshop & Networking Platform**
  - Raise awareness and advocate for better conservation.
  - Establish a platform for collaboration and collective action.
  - Share best practices, improve conservation standards, and build capacity.
- **Global Fund for Long-Term Conservation**
  - Provide predictable funding for operations, facilities, and research.
  - Support germplasm exchange, safety duplication, and standardized protocols.
  - Enable genomic characterization, establishment of core collections, and global information sharing.
  - Facilitate breeding and expanded use of diversity for improved flavor, disease resistance, and climate resilience.
- **Global Initiative for Comprehensive Conservation**
  - Conduct global surveys and mapping of vanilla diversity.
  - Prioritize *in situ*, *circa situm*[6], and *ex situ* conservation interventions.
  - Establish genetic reserves and early-warning systems.
  - Strengthen links between global collections, farmers, and protected areas.
  - Engage local authorities, communities, and NGOs to ensure long-term commitment.

Bibliography

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[6]*Circa situm* conservation is the conservation of the wild and semi-wild populations in the modified agricultural landscapes in and around farmers' fields.