Island Seeds, Global Legacy

Conserving Wild Plant of SIDS

Korea Arboreta and Gardens Institute (KoAGI)

** SIDS (Small Island Developing States): Island nations designated by the United Nations that are especially vulnerable to biodiversity loss due to climate change, geographic isolation, and limited conservation infrastructure*

PROJECT OVERVIEW

Project Title	Island Seeds, Global Legacy: Conservation Wild Plant of SIDS
Project Summary	An urgent, large-scale seed conservation initiative designed to safeguard SIDS biodiversity against accelerating extinction threats driven by the climate crisis.
Key Activities	① Capacity Building, ② Long-term conservation, ③ Research(optional)
Lead Organization	Korea Arboreta and Gardens Institute (KoAGI), operator of the Baekdudaegan Global Seed Vault (BGSV)
Geographic Focus	UN-designated SIDS across the Caribbean, Pacific, and AIS (Atlantic, Indian Ocean and South China Sea) regions
Keywords	#Biodiversity Conservation, #Seed, #Seed Vault, #Endemic Plants, #Endangered Plants, #Climate Resilience, #Ex-situ Conservation, #SIDS
Note	This project is directly linked to IUCN Resolution 094 (2025): Wild Plant Conservation to Ensure the Future of Small Island Developing States.
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1. Background

● Framing the Urgency: Dynamic Destabilization and the Accelerated Threat to SIDS Biodiversity

While the United Nations recognized the vulnerability of Small Island Developing States (SIDS) at the 1992 Rio Earth Summit, the nature of the ecological threats they face is far more complex and immediate than previously projected. Recent advancements in coastal geomorphology (e.g., Kench et al., 2018) reveal that coral reef islands are highly dynamic landforms. Rather than undergoing static, linear inundation due to sea-level rise, these islands experience severe geomorphic reconfiguration—rapidly eroding on established shores while migrating across their reef platforms.

Even if the total physical land area may sometimes remain stable through the accretion of sterile coral rubble, this violent physical dynamism triggers catastrophic terrestrial habitat collapse. The continuous erosion of established coastlines irreversibly destroys mature ecosystems, stable soils, and critical freshwater lenses. Conversely, newly accreted land consists of nutrient-poor, shifting sediments incapable of supporting existing endemic plant communities. Therefore, SIDS are not merely shrinking; they are experiencing extreme ecological destabilization. This rapid loss of ecologically viable and habitable land dramatically escalates the immediate risk of species extinction and underscores the critical urgency for proactive biodiversity conservation.

Recognizing this escalating crisis, the international conservation community has taken formal action. At the 2025 IUCN World Conservation Congress, Member States adopted Resolution 094: Wild Plant Conservation to Ensure the Future of Small Island Developing States. This resolution calls on governments and international organizations to strengthen ex situ seed conservation efforts for SIDS, to enhance capacity building in wild plant conservation, and to support the establishment of secure, long-term seed storage partnerships. The Seeds of Resilience project is a direct response to this mandate, translating the resolution's objectives into concrete, field-level action.

● Biodiversity Value of SIDS39 Regions

SIDS regions are globally significant reservoirs of plant biodiversity. Their geographic isolation has led to the evolution of highly specialized flora, much of which is found nowhere else on Earth. This biological uniqueness makes SIDS both ecologically irreplaceable and disproportionately vulnerable to extinction.

In the Caribbean, there are approximately 11,000 native seed plant species, of which an estimated 8,000 species (72%) are endemic (Colin Clubbe, 2013). Similarly, in Oceania's Micronesian islands, 1,227 plant species are native, and 364 species are endemic, giving the region one of the highest densities of endemic plants per land area globally (Costion & Lorence, 2012).

● Cultural Significance of Wild Plant Conservation

Beyond their ecological value, wild plants in SIDS are central to the daily lives, traditions, and identities of local communities. Many indigenous and island cultures rely on native wild plants for ceremonial purposes, traditional medicine, and food systems—often using crop wild relatives (CWRs) that have been integrated into regional cuisines. As rising seas threaten to erase entire islands, conserving wild plants also becomes a means of preserving cultural heritage, traditional knowledge, and the cultural identity and self-determination embedded in landscapes and species. Ex situ conservation ensures that both biological and cultural legacies are safeguarded for future generations.

● The Role of Ex Situ Conservation

To conserve wild plant biodiversity, both in situ and ex situ strategies are essential. In many SIDS contexts, however, seed-based ex situ conservation is the most practical and effective option on economic, logistical, and scientific grounds. Key drivers include the high cost of in situ management, limited ecological information for many native species, and the growing urgency driven by rapid habitat loss (Li & Pritchard, 2009; Riordan & Nabhan, 2019; Laslo et al., 2012).

2. Operation of the Project

Goal: Prevent the extinction of island flora caused by climate-induced habitat loss**.**

● Statement of Need

Despite this clear role, many SIDS face technical and financial constraints that limit the implementation of large-scale, rapid ex situ conservation. These constraints can be overcome through targeted international cooperation and capacity support, enabling effective, scalable seed collection, processing, and long-term storage.

● Project Design

In line with this need, KoAGI's integrated project (Table 1) combines capacity building, cooperative research (including storage-behavior assessment and cryopreservation for non-orthodox seeds), prioritized seed collection (with criteria such as orthodox seed behavior, native status, and IUCN Red List category), and long-term, duplicate storage via the Baekdudaegan Global Seed Vault (BGSV) and, where available, national seed banks.

< Table 1 > Contents of Project

Capacity Building	Long-term Conservation	Research
Goal	***Goal***	***Goal***
Build sustainable local expertise in seed conservation	Secure island flora through systematic seed collection and duplicated storage	Determine species-specific conservation pathways
Key Activities	***Key Activities***	***Key Activities***
• ToT Course in Korea • In-country Dissemination • On-site Technical Advice & Adaptation	• Priority-based Seed Collection • Standardized Seed Processing • Duplicated Storage at BGSV & national seed banks	• Storage Behavior Assessment • Storage methods for non-orthodox seeds

● Action Plan

▶ Capacity Building

Rationale

Collecting and processing seeds for long-term storage requires specialized seed-handling techniques. To ensure quality and sustainability, KoAGI trains practitioners from SIDS in wild plant seed collection and ex situ conservation methods.

Key Activities

STEP 1: ToT (Training of Trainers) Course in Korea

- Each participating institution nominates the trainer.
- KoAGI delivers a pre-training online module to establish a shared foundation of core concepts.
- Trainers attend an in-person, capacity-building course in Korea, covering seed collection, processing, viability testing, and propagation protocols.
- ToT (Training of Trainers): An educational approach to cultivate local trainers who can continuously and effectively build national capacity.

STEP 2: In-country Dissemination

- After completing the course, each trainer conducts dissemination training in their country to local staff.

- The in-country dissemination training transfers the knowledge gained in Korea to core field staff responsible for this project.

STEP 3: On-site Technical Advice & Adaptation

- Recognizing differences between conditions in Korea and partner countries, KoAGI deploys expert teams to provide on-site technical advice during field implementation.
- KoAGI teams help adapt protocols to local contexts and offer targeted, process-specific guidance throughout each step.

Long-term Conservation

Rationale

As wild plant habitats disappear, ex situ conservation is an effective, scalable strategy. Among ex situ options, seed storage is the most cost- and labor-efficient. However, only orthodox seeds are suitable for long-term, low-temperature storage.

Informed by a literature review, KoAGI and partner institutions prioritize species using criteria such as orthodox seed behavior, native status, and IUCN Red List category, and collect and store seeds accordingly.

Key Activities

STEP 1: Develop the Conservation Strategy

- Using the literature review and national floristic information, KoAGI and each participating country set collection priorities.

STEP 2: Seed Collection and Processing

- Trained local staff collect seeds in line with the priority list using standardized field protocols, and set and track annual targets.
- Collected seeds are cleaned and dried for long-term storage in line with international standards.
- KoAGI provides a Black Box kit (reinforced container, heat-sealable aluminum packets, silica gel, labels).
- Partner institutions package seeds using the kit per protocol.

STEP 3: Duplicated Storage

- The participating institution is expected to store collected seeds in duplicate at both the BGSV and its own seed bank. Where the institution does not maintain a seed bank or suitable long-term storage facility, it is strongly recommended that an additional copy of seeds be provided under the Open Box system, enabling KoAGI to conduct

viability monitoring at five-year intervals and share the results with the depositing institution.

- Each country can sign MoU, MoA and Material Transfer Agreement (MTA) with KoAGI to formalize ownership, storage, and withdrawal conditions.
- Basically, Seeds stored at BGSV are packed in Black Boxes and sealed with tamper-evident security labels; only the depositing institution has the right to access its box

▶ Research Component (optional)

Rationale

Despite substantial scientific effort, the storage behavior—i.e., desiccation and low-temperature tolerance—of many plant species from SIDS remains undocumented. To enable the most practical form of ex situ conservation—long-term seed storage in seed vaults—we must first determine whether each target species is orthodox.

Accordingly, this project conducts applied research in parallel with operations so that seeds are not only collected and stored, but are conserved accurately and appropriately for each species' biological characteristics.

Key Activities

Storage Behavior

- KoAGI and SIDS partner institutions jointly determine species-level storage behavior and translate findings into clear conservation decisions.
- Evidence mapping & gap analysis: Compile literature and local knowledge to identify data gaps for priority taxa.
- Rapid diagnostics: Screen for desiccation tolerance and tolerance to low-temperature storage using controlled drying and post-treatment viability/germination tests.
- Classification & documentation: Assign species to orthodox / intermediate / recalcitrant categories; record acceptance criteria (e.g., target moisture content, viability thresholds) and update the information.
- Decision support: Produce species profiles and a decision framework indicating whether seeds should be stored long-term in national facilities and/or BGSV or directed to cryopreservation.

Storage methods for non-orthodox seeds

- For species assessed as intermediate or recalcitrant, KoAGI—working with partner laboratories—develops or adapts storage methods protocols to enable long-term ex situ conservation.

- Protocol development/adaptation: Evaluate approaches such as vitrification, encapsulation–dehydration, or embryo/shoot-tip cryo, including pre-treatments (e.g., sucrose loading, cold acclimation) and moisture content targets.
- Small-scale validation: Conduct pilot trials to confirm post-cryo viability and normal seedling development; define acceptance criteria.
- Operationalization & sharing: Implement routine cryo storage for priority taxa; publish concise protocol summaries and share datasets with partner institutions, observing all ABS/MTA requirements and permits.

● Project Timeline

	Period	Phase	Description
1	Apr-Jun 2026	**Application**	Interested institutions submit expressions of interest. **Deadline: June 8th**
2	Jun – July 2026	**MoU Signing**	Memoranda of Understanding are formalized between KoAGI and each selected institution.
3	Aug 2026	**Online Pre-training**	Nominated trainers complete an online module to establish a shared understanding of core concepts before the in-person course.
4	Sep 2026	**Capacity Building Course in Korea**	Trainers attend an intensive in-person course at KoAGI, covering seed collection, processing, viability testing, and long-term storage protocols.
5	Oct-Dec 2026	**In-country Dissemination**	Trainers disseminate acquired knowledge and skills within their home institutions and national networks.
6	Mar – Apr 2027	**MoA Signing and On-site Advisory**	The MoA includes provisions for funding seed collection and long-term storage. KoAGI experts conduct in-country visits to provide field-level technical guidance.
7	Apr-Oct 2027	**Seed Collection and Processing**	Locally trained staff collect seeds of priority species in the field. Seeds are processed and prepared for long-term storage.
8	Nov 2027	**Duplicate Storage at BGSV**	Collected seeds are transferred to and stored in duplicate at the Baekdudaegan Global Seed Vault (BGSV).

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