

Reinforcing European *ex situ* conservation through AEGIS implementation and capacity building

Short title: AEGIS PLUS

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1. Background

At its 17th meeting in Oeiras, Portugal (May 2023), the ECPGR Steering Committee approved the objectives for Phase XI (2024-2028). These objectives are aligned with the priority actions of the *Plant Genetic Resources Strategy for Europe* (PGR Strategy), developed by ECPGR within the GenRes Bridge project (ECPGR, 2021)¹.

A key priority for this phase is the consolidation and sustenance of *ex situ* conservation by strengthening **A European Genebank Integrated System (AEGIS)** initiative. This directly contributes to the PGR Strategy's 2030 objective:

“By 2030, the PGR diversity in European genebanks is conserved reliably and made accessible for sustainable use by improving the efficiency and efficacy of the European genebank infrastructure”.

Achieving this objective will result in the establishment of a European *ex situ* conservation system of excellence, characterized by:

- i) **Long-term quality** for what concerns conservation management, viability, genetic integrity and phytosanitary protection.
- ii) **Enhanced accessibility** of conserved material to users.

Genebanks provide a vital service for farmers, breeders and researchers by maintaining and facilitating access to genetic resources, as well as for securing genetic material as an insurance for losses *in situ*, and for restoration or reintroduction. Both the demand for sustainable agriculture and food quality and the opportunities offered by allelic diversity mining and genomics-assisted breeding are evolving. It is therefore necessary to boost conservation capacities and increase facilitated access to the unique germplasm

¹ <https://www.ecpgr.org/resources/ecpgr-publications/publication/plant-genetic-resources-strategy-for-europe-2021>

conserved in Europe. Progress so far has been slow due to imbalanced activities and investments across the region. The network of *ex situ* genebanks in Europe is relatively well organized, however the existing infrastructure needs to improve its efficiency and efficacy of coordinated germplasm management. Conservation protocols, procedures and capacities vary across genebanks, as well as the ability to document and monitor genebank operations. The policy and capacity for germplasm distribution also varies between genebanks. These issues may contribute to under-exploitation of germplasm diversity and it cannot always be clearly demonstrated that material is securely conserved. Upgrading genebanks to appropriate levels can consist in removing specific bottlenecks, for example improving internal documentation systems or strengthening the regeneration and safety-duplication capacity.

Increased cooperation among genebanks by sharing responsibilities, standardization of protocols and increased availability of quality accessions for use are key elements to maintain an efficient regional infrastructure at the service of agriculture (breeders, researcher, farmers), as well as enabling policy-makers to comply with the implementation of international commitments, such as the FAO Second Global Plan of Action² and the International Treaty on Plant Genetic Resources for Food and Agriculture³.

The strategy to reach this objective involves:

1. Establishing an economically sustainable **certification system**, based on the AEGIS Quality System (AQUAS), with standards, performance indicators and a monitoring mechanism.
2. Creating **capacity building and facility improvement mechanisms** to help genebanks achieve AEGIS certification.

The AEGIS initiative facilitates the efficient and perpetual conservation of unique European germplasm within a decentralized **European Collection**, according to agreed AQUAS quality standards. Its benefits include improved conservation quality and safety, better genepool coverage, reduced redundancy and enhanced knowledge transfer. In the frame of the Pro-GRACE project, in which ECPGR has participated, ideas towards implementing a quality system have been further developed, supporting establishment of a certification system⁴. A critical quality aspect is the need for systematic safety duplication of genebank accessions, which is lagging behind with so far only 54% of AEGIS accessions having been safety duplicated. Stakeholders benefit through a more supportive genebank network, efficient resource use for policymakers, transparent access to high-quality data and material for breeders and other users, and secured long-term conservation of *ex situ* agro-biodiversity for the public. This is also an insurance to address future climate change and food security scenarios.

AEGIS was started in 2009 and currently has 35 member countries and 69 Associate Member (AM) institutions⁵. The EURISCO database has ~120k accessions flagged as

² <https://www.fao.org/4/i2624e/i2624e00.pdf>

³ <https://www.fao.org/plant-treaty/overview/texts-treaty/en/>

⁴ www.doi.org/10.46265/genresj.RFXB3570

⁵ <https://www.ecpgr.org/aegis/aegis-membership/overview>; <https://www.ecpgr.org/aegis/aegis-membership/associate-member-agreements>

AEGIS, i.e. that are part of the European collection of unique materials. The European Collection material is made available to users under the terms of the International Treaty (ITPGRFA), even for non-Annex 1 crops.

Between September 2024 and May 2025, funding from the BMLEH funding supported the '**New AEGIS**' project. This project helped AEGIS Associate Member (AM) institutions enhance operational transparency by developing genebank operational manuals, publishing Standard Operating Procedures (SOPs), piloting a genebank metrics system, and organizing reciprocal peer visits.

As a result, 18 operational genebank manuals and 3 SOPs were produced, the list of genebank metrics was tested by 15 pilot genebanks and a paper describing it was published in a peer-reviewed journal⁶. Genebanks reciprocal visits involved nine partners. A final project meeting in Prague, Czech Republic, May 2025⁷, identified persistent gaps and needs.

This proposal, **AEGIS PLUS**, as a natural continuation of New AEGIS, builds on the momentum created by the previous project, seeking to address the identified critical priorities with continued support from BMLEH:

- **Documentation systems:** Need for external advice to implement improved systems and integrate the metrics tool. With this support, several genebanks will be enabled to provide real-time monitoring of their operations and thus enhance their efficiency.
- **Technical Operations:** Organization of practical 'hackathons', i.e. short events to learn and improve upon specific operations (i.e. viability monitoring, germination testing, drying procedures, etc.). This type of capacity building will speed up upgrading of knowledge and capacities across the region.
- **Regeneration and Safety Duplication:** External support is required for critical regeneration efforts and to overcome safety-duplication bottlenecks limiting the inclusion of accessions into AEGIS. This action should serve to increase the size and the quality of the European Collection, expanding both safety and availability of germplasm for the use of breeders and researchers.
- **Operational Manual Template:** Update the genebank manual template based on previous expert review, ensuring backwards compatibility. Improving user-friendliness of the manuals will facilitate compilation of a key instrument to enable monitoring and certification of genebank operations.
- **Peer Reviews:** Expand the highly appreciated reciprocal peer review visits to more genebanks, including field orchards. This approach is revealing to be one of the most effective to spread knowledge, skills and standards across genebanks and to prepare them for a full-fledged certification system.
- **Accessibility:** A desk study is needed to analyze the distribution of AEGIS accessions, identify bottlenecks, and ensure compliance with AEGIS principles. Understanding the effective level of availability of material from genebanks will be the basis to enforce improvements and to eventually raise the reliability of the system and its users' (breeders, resercahers, farmers) trust in it.

⁶ <https://doi.org/10.1017/S147926212510021X>

⁷ https://www.ecpgr.org/fileadmin/templates/ecpgr.org/upload/AEGIS/Minutes_New_AEGIS_final_meeting_May_2025.pdf

2. Project description

The **AEGIS PLUS** project directly addresses the gaps identified above to accelerate the implementation of AEGIS principles among Associate Members (AM).

The project will provide direct support to improve genebank documentation systems, operational capacity, and critical infrastructure. This includes targeted training via hackathons, practical tools like an updated operational manual template, and direct contributions to overcome specific bottlenecks in safety duplication. A focused study on accessibility will ensure the system meets its ultimate goal: providing reliable access to users. Raising awareness among stakeholders about the project's activities and outcomes will generate multiple benefits. Breeders will become aware that genebanks are conserving well-characterized, high-quality material; policymakers will recognize the improved efficiency and effectiveness of genebank operations; and both groups will see the value of strengthened collaboration among European genebanks in safeguarding and using plant genetic resources. The expected impact is a significant elevation in the overall quality and reliability of European genebanks. By endowing them with improved tools, knowledge and resources, the project will strengthen the entire AEGIS system, enhance the availability of germplasm under the ITPGRFA, and prepare members for future genebank certification.

3. Project Objectives

1. **Enhance Operational Quality:** Provide advanced tools for AEGIS genebanks.
 - a. Support the integration of the 'metrics tool' into documentation systems for real-time quality monitoring.
 - b. Develop and disseminate a revised, user-friendly genebank operational manual template.
2. **Build Operational Capacity:** Strengthen the capabilities of AEGIS genebanks.
 - a. Conduct dedicated 'hackathon' workshops on technical genebank management procedures.
 - b. Provide direct support for the safety duplication of AEGIS accessions.
3. **Ensure Accessibility and Use:** Evaluate and improve the impact of AEGIS.
 - a. Conduct a desk study via questionnaire to analyze the distribution and accessibility of AEGIS accessions, identifying areas of improvement.

4. Activities

Building on the success of 'New AEGIS', these activities are designed for practical implementation and wide adoption. The ECPGR Secretariat will provide coordination and helpdesk support, in collaboration with key partners (e.g. CGN, the Crop Trust) and the ECPGR Genebank Managers Network.

- I. **Metrics Tool Integration Workshop:** A 2-day workshop for up to 10 documentation officers, organized at one of the AEGIS genebanks, facilitated by expert trainers, to install and implement the genebank metrics tool.

- II. **Manual Template Revision:** An expert group will prepare an updated, simplified, and more user-friendly operational genebank manual template.
- III. **Technical Hackathon 1:** A 2-day practical workshop for up to 10 curators to share, discuss and standardize best practices for key operations (e.g. germination testing, drying).
- IV. **Technical Hackathon 2:** A second 2-day hackathon in a different location for another 10 curators.
- V. **Safety Duplication Support:** Facilitate the safety duplication of up to 700 AEGIS accessions in a foreign genebank.
- VI. **Peer Review Visits:** Organize reciprocal peer reviews for 12 genebanks (including at least three field orchards) to share knowledge and improve standards.
- VII. **Accessibility Desk Study:** A study led by CGN and the ECPGR Secretariat to analyze the distribution levels of AEGIS material and identify access bottlenecks. A questionnaire will be prepared for AEGIS genebanks and verify the level of requests, accessibility and distribution of AEGIS accessions that they have experienced in the last 5 years. Follow up dedicated bilateral dialogue with the respondents will be arranged. Results will be analyzed and a report addressing any raised issue and proposing corrective measures will be prepared and possibly published in *Genetic Resources*.
- VIII. **Knowledge Sharing:** Update the AEGIS website with all project outputs and developments.
- IX. **Project Helpdesk:** The ECPGR Secretariat will provide ongoing advice and coordination for all activities.
- X. **Communication Materials:** Produce: a project factsheet for the public, prepared at the start of the project and to be updated at the end, to highlight objectives, key facts and achievements; a slide deck for presentations at conferences, with partners and networks encouraged to share widely; news items and social media posts (including short videos and animations) regularly developed and shared during and beyond the project.
- XI. **Final Dissemination Meeting:** An in-person final meeting held jointly with the ECPGR Genebank Managers network (up to 30 participants) to present results, discuss future collaboration, and review progress toward a genebank certification system.

5. Expected Outcomes

Outcomes of this project will upgrade documentation systems of up to 10 genebanks and improve skills and knowledge of up to 20 curators. These improvements, together with a revised and user-friendly template for the operational manual, will be essential preparatory steps to the introduction of a regional genebank monitoring and certification scheme. Reciprocal review visits will also significantly extend the number of genebanks becoming ready to get exposed to a formalized and transparent mechanism to verify and improve efficiency and effectiveness of operations. Safety-duplication (through regeneration) of up to 760 accessions will offer a significant contribution to the level of safety and accessibility of the European collection. A desk study to gauge the level of

accessibility of the European Collection will establish a benchmark measurement that can be utilized in the near future to introduce corrective actions, if needed. Dissemination and communication actions will serve to inform all involved stakeholders about the ongoing needs, efforts and results about the improvement of the *ex situ* system in Europe. Overall, the outcomes of this project will show that a coordinated and joint effort dedicated to increasing the efficiency of the European genebanks can provide cost-effective leap improvements and significantly increase their reliability, trustworthiness and capacity to serve for the conservation and use of PGRFA. This will be a landmark contribution to the PGR Strategy 2030 objective of European genebanks to ensure the long-term conservation of PGR and provide access to appropriate samples of the genetic diversity. Specific outcomes include:

- a) **Improved monitoring:** Up to 10 AM genebanks adopt the genebank metrics tool tested during the 'New AEGIS' project, enhancing their capacity for real-time, accurate operational monitoring.
- b) **Enhanced Technical Skills:** Up to 20 AM genebank curators increase their practical expertise through participation in hands-on hackathons.
- c) **Modernized Tool:** A revised, user-friendly genebank operational manual template is made widely available.
- d) **Expanded Peer Learning:** Twelve reciprocal review visits are completed, with the respective reports compiled and published online, now including field genebanks for the first time.
- e) **Enhanced regeneration and safety-duplication of AEGIS accessions:** up to 760 AEGIS accessions safety-duplicated.
- f) **Improved Access:** An accessibility study identifies obstacles to germplasm distribution and proposes concrete countermeasures.
- g) **Strengthened Community:** A final meeting disseminates results, fosters collaboration, and advances plans for genebank certification in Europe.

6. Chronogram of activities.

	2025	2026			
Activity	Q4	Q1	Q2	Q3	Q4
2-days workshop involving up to 10 documentation persons with an intention to install the genebank metrics tool in their documentation system.					
Preparation of updated template for genebank operational manual					
Genebank reciprocal visits					
2-days workshop (hackathon) 1					
2-days workshop (hackathon) 2					
Contribution to safety-duplication of up to 760 AEGIS accessions into a foreign genebank					
Desk top study based on a questionnaire, investigating the level of distribution of AEGIS accessions to users					
AEGIS helpdesk at Secretariat					
Preparation of public awareness products to publicize the project's outputs					
Final dissemination project meeting					