Reinforcement of the AEGIS Quality System and EURISCO data coverage (New AEGIS)

GenR 2024-1

(1 September 2024 – 30 May 2025)

Final report
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1. Background

The project proposal 'Reinforcement of the AEGIS Quality System and EURISCO data coverage (New AEGIS)' was submitted for funding to the Federal Ministry of Food and Agriculture in June 2024 and was approved with a budget of Euro 153,649 and a grant duration from 1 September 2024 until 28 February 2025, then extended to 30 May 2025.

Based on the ECPGR priorities for Phase XI (2024-2028), which are aligned with priority actions identified in the Plant Genetic Resources Strategy for Europe (PGR Strategy), this project intended to consolidate and sustain e*x situ* conservation and documentation in Europe, specifically by strengthening the AEGIS (A European Genebank Integrated System) initiative, and strengthening PGR information systems, through compilation and transfer of existing characterization and evaluation data to EURISCO. The project addressed some of the obstacles that have made the AEGIS initiative only partially successful until recently.

The main impact expected by this project was to improve transparency of operations of the AEGIS Associate Member (AM) genebanks, and their capacity to increase their quality, through a coordinated and centrally-supported commitment, preparation of monitoring tools and enhancement of peer support. Furthermore, the project intended to promote efficient sharing of genebank data, including phenotypic information.

The specific aim was to support the AEGIS AM institutions to honour their commitment to operate according to quality principles, starting with transparency of their operations. Capacities of the AMs were built through direct and indirect support, ensuring the preparation of operational genebank manuals, encouraging the publication in English of Standard Operating Procedures (SOPs), promoting a methodology to increase transparency of operations through the development of a list of agreed genebank metrics and organizing reciprocal peer visits across genebanks. A helpdesk at the ECPGR Secretariat ensured support to the AMs throughout the project.

Working Group Chairs were incentivized to complete crop-specific genebank standards, in collaboration with their WG members, also relying on the Secretariat helpdesk support.

Furthermore, the project collected existing characterization and evaluation data from previous ECPGR and EC projects and prepared them for inclusion in EURISCO.
Overall, these measures facilitated access to crop accessions and associated phenotypic data of underused European germplasm collections for use in research and breeding, contributing to adaptation measures to climate change and ensuring food security.

2. Objectives of the project

1. Strengthening of AEGIS by supporting the AEGIS Associate Members towards the implementation of their commitments
    - Facilitate preparation of missing operational genebank manuals
    - Analyze genebank manuals and provide observation/recommendations for action
    - Develop agreed genebank metrics documents by pilot genebanks
    - Translate and publish Standard Operating Procedures of pilot genebanks
2. Strengthening of AEGIS by completing the definition of AQUAS standards
    - Provide preparation of crop-specific standards as part of the AEGIS Quality System (AQUAS)
3. Improving C&E data coverage in EURISCO
    - Include into EURISCO existing characterization and evaluation data from at least 100 accessions each of different legume and vegetable crops phenotyped in previous projects.

3. Implementation of planned activities

3.1 AEGIS-related activities

i. A kick-off online Teams meeting was organized on 4 October with AEGIS Associate members (https://youtu.be/JO3LzasdCHA) to explain the project, discuss items for the implementation of AEGIS (genebank manuals, designation of AEGIS accessions, safety-duplication, distribution policy, quality system with peer reviews, Standard Operating Procedures, genebank metrics); volunteers were sought for pilot activities (analysis of genebank manuals, contribution to genebank metrics agreement, peer reviews). The meeting brought together over 60 participants and was the basis for the establishment in the following days of several contractual agreements towards the implementation of the project's tasks.

ii. Agreements for the preparation of genebank manuals were concluded with 12 Associate Member (AM) genebanks:

1. National genebank of Albania, Tirana, **Albania**
2. Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH, AGES, Linz, **Austria**
3. Centre wallon de Recherches Agronomiques, Gembloux, **Belgium**
4. LEPL Scientific Research Center of Agriculture, Tbilisi, **Georgia**

5. National Centre for Biodiversity and Gene Conservation (NCBGC) Tápiószele, **Hungary**
6. Germplasm Bank of the University of Pavia, **Italy**
7. Latvian Gene Bank of Cultivated Plants (SILAVA), Salaspils, **Latvia**
8. ISOPlexis Genebank of the University of Madeira, Funchal, **Portugal**
9. Portuguese Plant Gene Bank (INIAV) Braga, **Portugal**
10. Plant Gene Bank of Serbia, Belgrade, **Serbia**
11. Maize Research Institute, Zemun Polje (MRIZP), Belgrade, **Serbia**
12. The Swedish National Gene Bank for Vegetatively Propagated Horticultural Crops, Alnarp, **Sweden**
13. Germplasm Resources Unit at the John Innes Centre, Norwich, **United Kingdom**

A few other AMs decided to prepare their manuals free of charge and forwarded their final versions for upload on the AEGIS web site during the project's lifetime or shortly after its end:

1. Agricultural Research and Education Centre Raumberg-Gumpenstein, **Austria**
2. Czech Agrifood Research Center (CARC), Prague, **Czech Republic**
3. Polli Horticultural Research Centre Institute of Agricultural and Environmental Sciences Estonian University of Life Sciences, Polli, **Estonia**
4. Institute of Bioscience and Bioresources, CNR-IBBR Bari, **Italy**
5. National Centre for Plant Genetic Resources (IHAR), Radzikow, **Poland**
6. „Mihai Cristea" Plant Genetic Resources Bank, Suceava, **Romania**
7. Nordic Genetic Resources Centre (NordGen), Alnarp, **Sweden**
8. UK Vegetable Genebank (Warwick Genetic Resources Unit), Stratford-upon-Avon, **United Kingdom**
9. UK National Fruit Collection, (NFC), University of Reading, **United Kingdom**
10. Tops Potato Propagation Centre, **Ireland**

Genebank manuals for the five Slovenian Associate Members were started and are in progress

All the completed manuals are available from the AEGIS web site at: https://www.ecpgr.org/aegis/aquas/genebank-manuals

iii. Three experts (National Coordinators Petra Engels, Italy, and Silvia Strajeru, Romania under the leadership of Erik Wijnker, CGN the Netherlands) were tasked to analyze all the existing genebank manuals, with the objective of identifying strengths and weaknesses and elaborating a summary of the current mode of operation in the region, with annotations and recommendations. The final report is available for the project's website at:
https://www.ecpgr.org/aegis/projects/new-aegis

iv. Agreements were concluded with three AMs (University of Pavia, Italy, Suceava genebank, Romania, Isoplexis Madeira, Portugal) to provide translations into English of Standard Operating Procedures.

v. The CGN draft list of genebank metrics was submitted to 15 voluntary genebanks for testing, under the coordination of the Secretariat. The testing exercise has been completed and a manuscript describing the results was submitted to a peer reviewed journal and published in *Plant Genetic Resources Characterization and Utilization*

(DOI: https://doi.org/10.1017/S147926212510021X)

vi. Three Working Group Chairs agreed to prepare crop-specific standards for the respective crop Working Groups (Berries, Maize and Malus/Pyrus). The Berries and Maize were completed and made available at: https://www.ecpgr.org/aegis/aquas/genebank-standards/agreed-standards

vii. Nine AM genebanks agreed to participate in reciprocal peer visits to improve reciprocal knowledge and standards. Three trios were set up, with one experienced genebank in each trio offering the main guidance: 1) CRI, Czech Republic (lead), Georgia and Romania; 2) NordGen,Sweden (lead), Austria and Hungary; 3) CGN, The Netherlands (lead), Latvia and Portugal. Each partner travelled to visit the other two genebanks within the project's timeframe. Eight agreed reports of the visits were prepared and published on the AEGIS web site (https://www.ecpgr.org/aegis/aquas/peer-visits).

viii. The ECPGR Secretariat has been acting as helpdesk to provide advice on the implementation of all the agreed activities agreed, in particular for the preparation of genebank manuals, crop-specific standards, organization of peer reviews and development of a revised and agreed genebank metrics tool.

ix. An in-person final project meeting was organized in Prague 19-21 May 2025, together with the annual meeting of the Genebank Managers Network.

3.2 Activities to strengthen EURISCO

x. Agreements for the inclusion in EURISCO of phenotypic traits data were made with the following entities:

a. Albanian genebank, Albania, related to Albanian maize and wheat accessions.
b. INRAE, Le Rheu, France, related to *Brassica oleracea* and *Brassica rapa* accessions tested as part of the the EC project BrasExplore.
c. CREA, Pontecagnano, Italy, related to *Lycopersicon esculentum* accessions tested under the EC project BRESOV.
d. CREA, Conegliano Veneto, Italy, related to the local genebank *Vitis vinifera* accessions.
e. Suceava genebank, Romania, related to Romanian maize landrace accessions.
f. Plant Gene Bank, Belgrade, Serbia, related to Serbian wheat accessions tested during the GRAINEFIT project funded by the FAO Benefit-Sharing Fund.
g. Slovenian Institute for Hop Research and Brewing, Zalec, Slovenia, related to the local genebank *Humulus lupulus* accessions.

3.3 Public awareness activities

xi. The AEGIS website was updated with information on the project (https://www.ecpgr.org/aegis/projects/new-aegis) and the documents produced were also uploaded. Genebank manuals and SOPs are uploaded on the respective Associate Members detail pages https://www.ecpgr.org/aegis/aegis-membership/associate-member-agreements and on the AQUAS page: https://www.ecpgr.org/aegis/aquas/genebank-manuals**.** In addition, news items were produced to mark significant moments of the project (e.g. Strengthening plant genetic resource conservation and access: the 'New AEGIS' project; Standardized metrics proposed to improve genebank performance and transparency)

xii. A factsheet summarizing the main outcomes and impact of the New AEGIS project is available here. Social media posts were shared on the ECPGR LinkedIn account to showcase the results of the project (https://www.linkedin.com/feed/update/urn:li:activity:7405199121776889856). More posts will be produced to highlight specific key outcomes of the project.

4. Accomplishment of expected outcomes

4.1. AMs participating in the project increase their awareness of the AEGIS principles and contribute to increasing quality of operations and accessibility of the European Collection

The kick-off meeting organized online was the first occasion in which the Associate Members were gathered together. Several aspects of the quality system were clarified, with focus on the preparation of genebank manuals, standard operational procedures, use of genebank metrics tool and reciprocal genebank visits. The opportunities offered by the project triggered awareness among many Associate Members and National Coordinators alike about the need to implement the principles of AEGIS, in particular raising the quality of operation of the genebanks. The final physical meeting consolidated the awareness of the AEGIS principles, particularly clarifying the importance of establishing a quality system and understanding the steps needed in this direction. High participation in testing the metrics tool to record and quantify all genebank operations testifies interest and awareness about this aspect. The genebanks that participated in the peer review visits were particularly affected in a positive sense by awareness raising and capacity building since they repeatedly expressed high praise about this experience. Importance of safety-duplication was also frequently stressed and acknowledged, albeit financial and staff constraints are clearly limiting the possibility to be effective in many cases.

Increase in the total number of AEGIS accessions was not a direct objective, but this project acted as a trigger also in this direction at least in a few countries, such as Hungary, that included accessions in AEGIS for the first time (559), Albania and Estonia, raising their number of AEGIS accessions from 8 to 610 and from 275 to 375, respectively.

4.2 At least 20 new operational genebank manuals developed

Overall, 22 manuals were provided during the project lifetime or shortly after; ten of these were prepared free of charge. Other two (from Slovenia and MRZIP, Serbia) were in preparation, but have not yet been completed.

4.3 All prepared genebank manuals are analyzed and compared. This analysis generates an overview of current practices, and general and specific recommendations for improvement

The analysis of the genebank manuals was carried out by three experts, who were able to analyze in total 30 manuals, including already existing ones and those freshly prepared. Their objective was to verify whether the responses in the manuals were logical, clear, complete, and relevant and whether the current manual template help genebanks to provide clear and meaningful information. The review produced two key outputs, that is 'Feedback on individual genebank manuals' and 'Recommendations on the structure and design of the genebank manual template'. Feedback on individual manuals was compiled and provided by the Secretariat to each manual compiler. A list of general observations on the replies and on the template are provided in the experts report. For respondents, the emphasis is on providing clear, concise, and complete answers, updating manuals

regularly, and incorporating peer feedback. The template requires simplifying the structure, eliminating redundancies, and encouraging standardized responses.
The New AEGIS genebank manual review revealed a varied landscape in the documentation quality of genebank practices across Europe. While the initiative stimulated the development of new manuals, it also highlighted the need for improvements in clarity, completeness, and consistency. This variability reflects the differing capacities, resources, and levels of experience among genebanks across Europe. The recommendations serve as guidance for enhancing the usefulness and transparency of genebank manuals under the AEGIS framework.

4.4 Three sets of crop-specific genebank standards are developed

Two sets of crop-specific standards were prepared and agreed by the Berries and Maize Working Groups. The *Malus*/*Pyrus* standards remained in preparation. These standards are helpful to guide genebanks towards high quality procedures and will also fix a quality benchmark to be used as a reference for future peer review mechanisms or quality certification systems.

4.5 Between five and ten AMs agree to make their Standard Operating Procedures public and provide their translations in English

Only three AM (Suceava genebank, Romania; Isoplexis, Madeira, Portugal; and University of Pavia, Italy) provided their SOPs and made them public through the AEGIS web site. It has been difficult to convince more AMs to make these documents public, given that these are often considered as internal documents or they do not exist. Nonethelees, this small increased presence of examples of SOPs is expected to stimulate others to get inspiration from the detailed procedures and engage into developing them for their own, as well as to inspire trust to make them public for general transparency.

4.6 A genebank metrics list is agreed by a group of pilot genebanks and a document is ready in advanced draft for publication

The genebank metrics list has been tested by at least 15 genebanks, including WoldVeg in Taiwan. The genebanks generally found this tool very useful to organize their internal management around systematic recording of quantitative data. A few comments were provided for adjustments. A document summarizing the testing exercise and compiling the revised metrics was prepared in the form of a manuscript submitted for publication in *Plant Genetic Resources Characterization and Evaluation*. The article was accepted and published with DOI: https://doi.org/10.1017/S147926212510021X**.** This tool, which remains work in progress, will greatly facilitate and stimulate monitoring and accuracy of all genebank management operations and thus improve the quality system of all the genebanks adopting it.

4.7 Existing characterization/evaluation data for as many as possible accessions of grain legumes, vegetables and other PGR accessions made available via integration in the EURISCO catalogue.

Following agreement with various institutions to provide phenotypic data to EURISCO (see above), the following datasets were either included or forwarded to EURISCO or under preparation:

a. 17 traits for 193 maize and 18 traits for 409 wheat accessions from Albania
b. 12 traits related to 36 populations of *Brassica rapa* and 18 traits related to 40 populations of *Brassica oleracea* from France
c. 36 traits related to 412 *Lycopersicon esculentum* accessions from Italy
d. 3 traits across eight years related to 651 *Vitis* accessions and two traits for one year related to other 247 *Vitis vinifera* accessions from Italy
e. 19 traits related to 125 maize accessions from Romania
f. 52 traits related to 163 wheat accessions from Serbia
g. 8 traits related to 203 hop accessions from Slovenia

4.8 Six reciprocal review visits of genebanks are completed, with the respective reports compiled and published online.

Nine genebanks, more than the planned six, volunteerd to undertake reciprocal visits, organized in three trios where each genebank visited the other two. As indicated above, reports were published and one presentation was offered in the final meeting by each trio, summarizing main highlights of the experience, including strengths and weaknesses of each genebank.

4.9 A kick-off online meeting and a final physical meeting of AMs are organized and held. A report of the final meeting is published online.

i. The kick-off online meeting was held in October 2024. The final in-person meeting was organized in Prague, 19-21 May 2025, together with the annual meeting of the Genebank Managers Network. 37 participants attended from 27 countries. The project's outputs were presented. In particular, discussion focused on:
   a. recommendations regarding the structure of the operational genebank manual's template and its compilation
   b. publication of SOPs
   c. comments following the testing of the genebank metrics and further steps towards implementation of this tool
   d. peer review experiences
   e. safety duplication and distribution policies
   f. perspectives for an increased coverage of the European Collection with multiplications and safety-duplications
   g. Future opportunities

The minutes of the meeting and all the presentations given are available from the New AEGIS project website at: https://www.ecpgr.org/aegis/projects/new-aegis.

5. Financial report

The Financial Report shows a remaining balance of €17,092. Lower expenditures resulted from contributions made by partners, such as in-kind inputs (e.g., manuals), and from the inability of some partners to complete certain tasks within the project's short timeline (e.g., developing crop-specific standards and submitting phenotypic data to EURISCO). Additionally, the paper on genebank metrics was published at no cost to the project. However, due to a project extension and continued coordination—including organizing the meeting in May 2025—Secretariat staff costs exceeded the budget by approximately 10%. The remaining balance of €17,092 will be returned to the donor.

6. Conclusion

The "New AEGIS" project has successfully laid a robust foundation for strengthening the quality and transparency of *ex situ* PGR conservation in Europe. By directly supporting genebanks in developing operational manuals, standardizing procedures, implementing a genebank metrics tool, and fostering collaboration through peer reviews, the project has tangibly enhanced the operational capacity of a significant group of AEGIS Associate Members and paved the way for others to follow in this direction. Furthermore, the integration of valuable phenotypic data into EURISCO has greatly improved access to a selected set of underutilized germplasm for research and breeding, increasing awareness of the value of a centralized hub for the permanent deposit of standardized data. The project has not only achieved its specific objectives but has also revitalized the collaborative spirit of the AEGIS network, creating a solid platform for future initiatives aimed at ensuring the long-term conservation and use of Europe's plant genetic resources.