A European Genebank Integrated System

REVISION OF THE AEGIS OPERATIONAL GENEBANK MANUAL TEMPLATE

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1. The AEGIS PLUS Project

AEGIS PLUS (Reinforcing European *ex situ* conservation through AEGIS implementation and capacity building) is a project funded by the German Federal Ministry for Agriculture, Food and Regional Identity (BMLEH) and coordinated by the Secretariat of the European Cooperative Programme for Plant Genetic Resources (ECPGR). The project runs from October 2025 to December.

AEGIS PLUS is a direct continuation of the preceding New AEGIS project (September 2024 – May 2025), which supported AEGIS Associate Member genebanks in developing operational manuals, piloting a genebank metrics system, and organizing reciprocal peer visits. As a result of New AEGIS, 18 new operational genebank manuals were produced, a genebank metrics system was tested by 15 pilot genebanks, and a paper describing this genebank metrics system was published in a peer-reviewed journal.

AEGIS PLUS builds on this momentum by addressing the critical gaps and needs identified during the New AEGIS project and presented during the final project meeting in Prague (May 2025). The AEGIS PLUS project pursues three overarching objectives:

- Enhance Operational Quality – providing advanced tools for AEGIS genebanks, including integration of the genebank metrics tool into documentation systems and the development of a revised, user-friendly operational manual template
- Build Operational Capacity – conducting dedicated 'hackathon' workshops on technical genebank management procedures and providing direct support for the safety duplication of AEGIS accessions
- Ensure Accessibility and Use – conducting a desk study to analyze the distribution and accessibility of AEGIS accessions and identifying areas for improvement.

Among the specific activities foreseen are: a metrics tool integration workshop, revision of the manual template (the subject of this report), two technical hackathons, safety duplication support for up to 700–760 accessions, 12 reciprocal peer review visits, an accessibility desk study, and a final dissemination meeting. The expected outcomes include upgraded documentation systems in up to ten genebanks, improved technical skills for up to 20 curators, and a revised operational manual template made widely available to all AEGIS members.

2. Revision of the Manual Template

The revision of the AEGIS Operational Genebank Manual template was identified as a key activity within AEGIS PLUS. The original template, formally approved by the AEGIS Advisory Committee on 24 September 2010, had served as the basis for genebank manuals prepared by Associate Members for over a decade. Whilst the template remained fit for purpose in many respects, practical experience – and in particular the systematic review carried out during the New AEGIS project – revealed a number of structural and usability issues that warranted attention.

As part of New AEGIS, a targeted review of 32 genebank manuals from 17 European countries and NordGen was conducted by Petra Engel, Silvia Străjeru and Erik Wijnker. The review assessed both the quality (in terms of completeness and coherence) of the documentation produced by genebanks and the effectiveness of the template as a guiding instrument. Key findings included that only 52% of all answers in the reviewed manuals were complete, that the navigation structure in Section 3 was confusing for respondents and readers, that numerous questions were redundant or overlapping, and that several questions were formulated in a way that led to divergent or ambiguous answers across genebanks.

The present document reports on the revisions made to the template in response to these findings. The revised template was developed by the same authors as for Activity II of the AEGIS PLUS project. Care was taken to ensure backwards compatibility with the original template, so that genebanks that wish to update their existing manuals can do so without having to start from scratch. The general structure and scope of the template have been preserved; the changes are primarily concerned with clarity, usability and logical organization of the content.

3. Description of Changes Made to the Template

The following sub-sections describe each of the main changes made in moving from the original (2010) template to the revised version.

3.1 Removal of Navigation Boxes

The original template made extensive use of 'navigation boxes' – highlighted tables positioned at the beginning of each sub-section of Section 3 (Germplasm Maintenance) that directed users to the appropriate sub-questions depending on their conservation method (seed, *in vitro*, cryopreservation, or field collection). While the intent behind these boxes was helpful, in practice they were found to interrupt the flow of the document and were experienced as cumbersome by respondents.

In the revised template, the navigation boxes have been replaced by straightforward numbered lists of questions. These lists are clearly headed by the relevant conservation type, making it immediately obvious which questions apply to which collection type. This change simplifies the visual presentation of the template and makes it easier to navigate without the need for separate routing instructions.

3.2 Streamlining and Reformulation of Questions

A significant effort was made to streamline the content of the template. Drawing directly on the findings of the New AEGIS Manual Review, the following types of changes were implemented:

- Removal of redundant questions. The review identified a number of questions that were nearly identical to one another, or that covered the same ground in different sections. Where feasible, such questions have been removed or merged into a single, more comprehensive question.

- Reformulation of ambiguous questions. The review found that several questions yielded highly divergent answers across genebanks, suggesting that respondents interpreted them differently. Such questions have been rewritten to reduce ambiguity and increase the likelihood of consistent, comparable responses.
- Care has been taken to reformulate questions in such a way that respondents are persuaded to answer questions separately, rather than answering several sub-questions in one comprehensive answer. This should decrease the likelihood of genebanks forgetting to answer certain questions.

The overall effect of these changes is a more concise template that is easier and less time-consuming to complete, while retaining the full breadth of information needed for operational transparency and genebank monitoring.

3.3 Grouping of Questions by Conservation Type

One of the structural weaknesses of the original template was that questions in Section 3 were organized primarily by topic (e.g. viability monitoring, genetic integrity, availability), with the different conservation types (seed, *in vitro*, cryogenic, field) then addressed as sub-categories within each topic. This meant that a genebank managing only one type of collection – which is the most common situation – nevertheless had to navigate through material pertaining to other collection types in order to find the questions relevant to them.

In the revised template, the organization within relevant sections has been inverted: questions are now grouped first by conservation type, with all topics relevant to that type presented together. A genebank operating a seed collection, for instance, will find all seed-related questions grouped sequentially, without needing to skip over sections addressing *in vitro* or field collections. This change significantly improves the usability of the template for the large majority of genebanks that specialize in one or two conservation methods, while still ensuring complete coverage for those that use all four.

3.4 Restructuring of the Germplasm Maintenance Section

In the original template, Section 3 was entitled 'Germplasm Maintenance' and contained three sub-sections: Maintaining Viability (3.1), Maintaining Genetic Integrity (3.2), and Ensuring Availability (3.3). Whilst this grouping was logical in the sense that all three are aspects of germplasm management, the inclusion of 'Ensuring Availability' within the Germplasm Maintenance section risked obscuring the distinct importance of availability as a genebank objective in its own right.

In the revised template, 'Ensuring Availability' has been separated from the Germplasm Maintenance section and elevated to its own dedicated section (Section 4). The Germplasm Maintenance section (now Section 3) retains its focus on viability and genetic integrity. This restructuring better reflects the conceptual distinction between conserving germplasm (maintenance) and making it accessible to users (availability), and aligns the template more closely with the way genebank operations are typically described in quality management frameworks.

3.5 New Section on Characterization and Evaluation Activities

The revised template introduces a new section – Section 5: Characterization and Evaluation (C&E) – that was not present in the original template. This section allows genebanks to provide information on the C&E activities they carry out on their collections, including details on the types of characterization and evaluation performed, the crops or species targeted, any collaboration with external partners, and the way in which C&E data are recorded and made available.

The inclusion of this section responds to a recognized gap in the original template. C&E activities often are a central component of genebank operations: they add value to conserved accessions by generating data that supports their use by breeders, researchers and farmers. Moreover, C&E data are increasingly important for the AEGIS quality framework, as they contribute to the documentation and accessibility objectives of the system. By providing a dedicated space for this information, the revised template encourages genebanks to document and share their C&E efforts more systematically.

3.6 Separation of Documentation and User Services

In the original template, Section 4 was entitled 'Providing Information' and contained two sub-sections: the Genebank Documentation System (Box 4.1) and Information Exchange (Box 4.2). Whilst both topics fall broadly under the umbrella of information management, grouping them together under the heading 'Providing Information' understated the importance of the internal documentation system as an instrument of genebank management, and obscured what are functionally quite different aspects of genebank operations.

In the revised template, these two sub-sections have been separated into two distinct sections:

- Section 6: Genebank Documentation System – covering the technical and operational aspects of the internal database and information management systems used to support collection management. This section recognizes that a well-functioning documentation system is a prerequisite for virtually all aspects of genebank management, going well beyond its role in 'providing information' to users.
- Section 7: Information Exchange/User Services – covering the processes by which genebanks make data and material available to external users, including data publication to EURISCO, web services, and the provision of information accompanying distributed germplasm.

This separation provides greater clarity about the dual role of genebank information systems: as operational management tools on the one hand, and as user-facing services on the other.

3.7 Backwards Compatibility and Overall Continuity

A guiding principle throughout the revision was to preserve backwards compatibility with the original template. The revised template does not remove any information that was present in the original; rather, it condenses, reorganizes, and, where necessary, reformulates it. Genebanks that completed a manual based on the original template should therefore be able

to update their documentation by transferring existing answers to the corresponding sections of the new template, in most cases with little difficulty.

The table below provides a mapping of the original sections to their equivalents in the revised template, to assist genebanks in this process.

Original Template (2010)	Revised Template (AEGIS PLUS)
0. Date of Compilation	0. Genebank Manual Details
1. Germplasm Acquisition and Accessioning	1. Germplasm Acquisition and Accessioning
2. Ensuring Security	2. Ensuring Security
3. Germplasm Maintenance (incl. 3.1 Viability, 3.2 Genetic Integrity, 3.3 Ensuring Availability)	3. Germplasm Maintenance (3.1 Viability, 3.2 Genetic Integrity) 4. Ensuring Availability [new stand-alone section]
— (not present)	5. Characterization and Evaluation [new section]
4. Providing Information (Box 4.1 Documentation System, Box 4.2 Information Exchange)	6. Genebank Documentation System 7. Information Exchange / User Services

4. Additional Improvements

In addition to the changes described above, the revision also incorporated a number of smaller improvements that collectively contribute to the usability and quality of the template:

- Introductory text per section. Each section of the revised template now opens with a brief introductory paragraph explaining the purpose and scope of that section. These introductions provide context for the questions that follow and help respondents understand what information is being sought and why it is relevant.
- Adapting questions to the conservation type. Questions in the old Manual were very much centred on seed conservation, and sometimes replicated in for other conservation types, without specifically adjusting to the target. These questions have been reformulated or made more pertinent to the other conservation types, if necessary.
- Improved question numbering. The revised template uses a clearer and more consistent numbering system that links question numbers explicitly to section numbers (e.g. Seed-3.1.1, Seed-3.1.2), making it straightforward to locate and cross-reference specific questions.

- Updated instructions for respondents. The general instructions at the beginning of the template have been reviewed and updated to reflect current practice and expectations, including guidance on the use of 'N/A' for non-applicable questions and on how to reference online protocols and SOPs.
- Updated cover section. The original template's cover section contained only a date field. The revised Section 0 now includes fields for genebank name and address, manual date, and links to relevant online resources such as the genebank website, SOPs, and quality management system documentation, providing a cleaner and more informative entry point to each completed manual.

Together, these enhancements are intended to make the template more approachable for genebank curators, particularly those who are completing a manual for the first time, and to improve the overall consistency and comparability of manuals produced across the AEGIS network.

5. Conclusion

The revised Operational Genebank Manual template represents a significant improvement over the 2010 version in terms of usability, clarity, and logical organization. It also takes track of developments in germlasm characterization an evaluation, which over the recent years have become more concerted and structured activities within genebanks, including their documentation and public availability. The changes described in this report were motivated by concrete evidence from the New AEGIS manual review, which systematically identified the weaknesses of the original template as reflected in the quality and completeness of manuals produced by AEGIS Associate Members.

By removing cumbersome navigation boxes, reducing redundancy, reorganizing questions by conservation type, separating previously conflated sections, and adding a new section on C&E activities, the revised template better serves its core purpose: to guide genebank curators in documenting their operational practices in a clear, comprehensive, and comparable manner.

Genebanks that have already prepared a manual using the original template will find that the overall structure is familiar and that most of their existing content can be transferred to the new template with minimal effort, in line with the backwards compatibility objective that guided the revision.

It is anticipated that wider adoption of the revised template will contribute to improved documentation standards across the European genebank network, supporting the longer-term goal of establishing a formal genebank monitoring and certification scheme under the AEGIS Quality System (AQUAS).