Genebank Review

Austrian Genebank, AGES – Austrian Agency for Health and Food Safety, Linz, Austria

6-7 May 2025

AEGIS Project

AEGIS Project – Genebank Review

Genebank Reviewed: Austrian Genebank, AGES – Austrian Agency for Health and Food Safety, Linz, Austria

Date: 6-7 May 2025

Participants AGES: Sylvia Vogl, Lisa Achathaler, Maria Zimmerbauer, Ulrike Leitenbauer, Rudolf Etzelt and Kurt Wurzer

Reviewers: Attila Simon, Csaba Péterfy, Bence Mala (NBGK, Hungary) and Lise Lykke Steffensen (NordGen, Sweden)

Background

This peer review report is a delivery within a project under the European Genebank Integrated System (AEGIS) and is funded by the German Federal Ministry of Food and Agriculture, the project aims to strengthen AEGIS by improving quality and transparency in its Associate Member genebanks through the preparation of genebank manuals, publication of Standard Operating Procedures, development of agreed genebank metrics and peer support. The project will also reinforce EURISCO by including dispersed phenotypic data from previous European projects.

This report is part of the genebank capacity building peer visits, where genebanks are visiting and reviewing each other's institutes contributes to improving the quality of genebanks. The first cycle of mutual visits began in 2019 and continues today.

The review concerns the organisation and operations of the genebank, and results in a report with recommendations for improvement.

This document reports on the peer review of the Austrian Genebank, AGES – Austrian Agency for Health and Food Safety, Linz, Austria that was undertaken the 6-7 May 2025.

Visit/Organization

The visit was organized by Sylvia Vogl, the group leader of the Austrian Genebank, AGES – Austrian Agency for Health and Food Safety, Linz, Austria with support of her colleagues. A draft of an operational Manual was provided

before he peer-review. The Operational Manual will be adjusted accordingly based on the results of the review.

. The Manual provided a basis of the review as it describes the organization and general procedures of the genebank.

Flights and lodging were arranged by the reviewers – everything else was organised by the hosts.

Based on an agenda for the two-day review, all operational aspects of the genebank, including the facilities, have been reviewed and discussed. The reviewers met and discussed all topics of the agenda and the Operational Manual with the responsible staff.

The genebank is part of the Austrian Agency for Health and Food Safety in Linz, Austria. The reviewers visited all genebank facilities that include seed handling spaces, offices, drying room, the germination testing lab, storage facilities, the green house and the regeneration site. Following the visit the reviewers presented a first draft of their impressions of the genebank operation and management to the staff members.

Austria has ratified the Convention on Biological Diversity and the International Treaty on Plant Genetic Resources for Food and Agriculture and has committed the country to conserve and facilitate access to the plant genetic resources in the genebank. The Austrian Genebank at AGES is a part of this commitment and has an important role in safeguarding the plant genetic resources needed to combat climate change, preserve biodiversity, increase national preparedness and food safety. The recommendations in this report must be seen in this light as the genebank is in a situation where some of the recommendations would require immediate action and could have budgetary consequences.

Outcome of the Review

The most important outcome of the review was the exchange of views on approaches and insights regarding the conservation and use of PGRFA.

Our recommendation is based on findings on site and should be seen as such.

In addition to this general outcome, many observations were made. Some of them could be translated into recommendations that are presented as follows.

Organisation, management and funding

The most important and most urgent recommendations are found to be within the organization, management and funding. Although some other actions might be done here and now, most recommendations require leadership and/or management decisions before the actions can be taken on the operative part.

Genebank management and operation would possibly benefit from having its own national strategy with strategic ambitions and directions for the future development of the conservation and facilitated use of the plant genetic resources in the genebank. Followed up by Actions plans on the operative level.

The genebank is recommended to upgrade several functions and facilities and the current funding is judged to be insufficient for the activities at the current level. To be able to take the genebank to the next level, further funding will most likely be necessary.

The genebank has great human capital in the group leader and the staff with an excellent understanding of how to manage and operate a genebank. Further, the employees are very enthusiastic and committed to making the genebank operations work well and even better tomorrow. All in all, a very good human capital to take the genebank to the next level.

Internal operative guidelines and administrative documents are largely in place. This is to a wide extent due to a very good understanding of what and how a genebank should operate and this is given in the excellent quality management system that exists within the AGES organization and the genebank

Actions need to be taken immediately to solve the current unsolved backlogs. There has over the years been built up significant backlogs with more than 70% of the seed collection lacking germination tests, regeneration and seeds that immediately need to be dried down. This could possibly pose a threat to the long-term conservation of the seed collection. The staff has the knowledge and commitment, but is found to be understaffed, and it seems like the allocated management hours of 23 hours for the group leader are not sufficient to both manage the operations, the internal processes, developments and international engagement.

Although they have limited resources, it was found very positive that the outreach the latest years have increased with fruitful collaboration on national, regional and European level.

The genebank offices and labs are situated greatly in the building and found to be a good foundation for conducting the work. However, the two laboratories need to be upgraded to current standards. Other rooms/facilities are unfortunately in most cases unsuitable for the purpose and in some cases poses a threat to the long-term conservation of the seed collection and to the health and safety of the staff.

The equipment for conducting the operations in the seed lab and in the germination lab could benefit with an upgrade and more adequate modern technology to improve the efficiency, accuracy and quality of the work and functions of the genebank activities. Further, the drying facilities are not living up to usual standards and would greatly benefit from more adequate techniques and equipment.

The genebank leverage positively from being part of a larger institution with many supporting functions and capabilities. Further synergies are probably to be found and for the benefit of the institute.

The genebank has a comprehensive and well-functioning quality management system (QMS) with all relevant components for such a system. The genebank benefits from the set-up and discipline in working with a QMS system in a larger organization. Further, the recently introduced performance testing is a bonus and so are the ambitions to do more.

Recommendations on management and funding

Recommendation 1

Consider making a long-term strategy for the strategic ambitions of the development of the genebank and consider, if synergies can be obtained by mergers with other Austrian genebank collections.

Recommendation 2

Prioritize to make action plans for how to reduce the very large backlogs in regeneration, drying and viability testing.

Recommendation 3

Take actions to upgrade the facilities as these are in many cases unsuitable for the purpose and in some cases poses a threat to the long-term conservation of the seed collection and to the health and safety of the staff.

Recommendation 4

Consider improving the efficiency, accuracy and quality of the work and functions of the genebank activities by introducing more adequate modern equipment and technology.

Recommendation 5

Consider upscaling the management hours for the operations and management of the genebank.

Recommendation 6

Continue to refine and strengthen the quality management of the genebank and involve employees to a greater extend to take responsibility for and ownership of documents that relate to their work.

Recommendation 7

Consider to change the responsibility level and empower the quality manager to be the one who can approve documents and make the team leader responsible for the overall genebanks quality management system.

Germplasm Acquisition and Accessioning

AGES proves that they acquire all material legally to their genebank. Through their established network, all formerly registered Austrian varieties automatically being sent directly from the variety registration authority to the genebank for storage after their registry gets deleted. These ways of acquisition ensures that the incoming material meets the general quality standards (e.g. seeds from at least 30 to 60 plants depending on species/plant group, transparently documented background of the material, etc.). They organized seed collecting missions in the past, however unfortunately this activity is on hold at the moment due to legal aspects. Only CWRs and wild species are collected from field with the support of the relevant National Parks.

We found that the incoming material is being recepted on a separate floor where first inspection on purity and health is being done. However, some of the materials - especially from the variety registration authorities – are received in sealed plastic bags and due to lack of capacity in reception they often stay there for too long which raise concerns on the quality of the material.

Temporary storage is managed in the same room where drying processes are also performed.

After an accession number is generated and assigned and all the relevant data are entered to their genebank database, the material is transferred to the seed handling lab where further analysis is performed.

Recommendation 8

Temporary storage of received material should exclude the use of sealed plastic bags, especially if temporary storage takes too long. This material is recommended to be transferred in paper bags to preserve their quality and release excess moisture.

Recommendation 9

Temporary storage is recommended to be organized in a separate room with no other functions, under controlled temperature and humidity conditions.

Recommendation 10

Take more precise precautionary actions to prevent phytosanitary risks when receiving incoming material. Consider having a restricted isolated area for incoming material to be stored and checked before coming into the seed lab.

Collection Material Distribution and use, Availability

AGES genebank operates with a transparent database available for the public. Apart from basic passport data, more detailed information about most of the accessions is also public and available. On their website one can filter information with a wide range of parameters, like C&E data. At the moment approximately 85% of all genebank material (4700 accessions) is open for public orders, however the number of incoming orders is relatively low (875 accessions for 2006-2025 period and only 55 accessions and 4 STMAs in 2024).

If sufficient material is available, they ship 200 viable seeds for cereals, for large, seed materials usually 30-50 viable seeds are provided. Processing of orders is well organized and quick; they ship the requests within 1-2 weeks with all the necessary information. For export to third countries a phytosanitary certificate is being issued according to the Plant Health Regulation.

Recommendation 11

Consider to request detailed feedback information from direct users about the genebank materials. It could be done with inclusion to the agreements with farmers or the option of a form to be filled on the website.

Security and safety of the collections and staff

Security and safety for the premises and the collections are of outmost importance. AGES is situated in an area which is known for stable geological conditions and generally well protected from most risks posed by climatic conditions. There is a risk assessment for the institution and yearly training in rescue measures in case of fire. There are fire detectors in all rooms. All in all, there are already taken many measures to protect the Agency and the genebank. A few more initiatives can be taken to protect the genebank and the seed collection in cases of threats and emergencies. A contingency plan for the genebank and the safety of the seed storages can be made to optimize the protection of the seed collections.

Although, recognizing that approx. 3.800 of the seed duplicates are duplicated and stored in other genebanks in black box arrangements, we judge that the collections do not have a sufficiently safety backup. The genebank should strive towards a full backup of the collection in both a first backup in a remote place and a second backup at Svalbard Global Seed Vault.

When being introduced to the workspaces and the health and safety of the staff a few things were noted that could be improved to provide better efficient tools and improve the working spaces. There is a general lack of adjustable tables, insufficient lighting at working stations and in the storages, labs and drying room. Better equipment like video microscopes and better seed handling tools could help the staff to be both more efficient and give better health for them as well.

The container used today for threshing is not suitable as a working station for threshing with machinery and a threat to staff health and safety as there are no air extraction equipment and too little space in the container. The entrance to the storages was found to be extremely noisy and either the staff must work with hearing protection, or the noise must be reduced significantly. We found that the seed storages had too little space for working safely. The storages are filled with too many boxes piled up all over.

The seed storages are judged to be unsuitable for the purpose. No surveillances on the outside and you can walk from the street and directly to the door of the seed storages. The long staircase makes it difficult to access when bringing seeds in and out of the storages. The doors are in a poor condition and there are no real access restrictions. There are no automatic surveillances and no electronic monitoring system of the temperatures. Inside the storages, the humidity in the rooms is extremely high which leads to frost, ice and moisture on the glasses of the small seed containers, shelves, floor and ceiling. Also icing were found in the cooling system. It could be investigated if the humidity comes from the surrounding of the basement and if the facility is the right place for storing a seed collection on the longterm.

Recommendation 12

Consider making a contingency plan to be prepared for any possible threat in the future.

Recommendation 13

Introduce surveillance on the outside of the building of the seed storages and make an even more restricted and secure access to the seed collections.

Recommendation 14

Prioritize to get a major upgrade of the seed storages or simply move to a better building and create better conditions for storage.

Introduce an electronic monitoring system in the seed storages with more than one sensor and direct reporting to staff.

Recommendation 15

Create a full safety backup of the Active collection in a remote reliable safe location and the Svalbard Global Seed Vault as the collection is not sufficiently backed up

Germplasm Management

The staff have very good knowledge of the requirements for a professional operating genebank. The procedures and standards are found to be aligned with the FAO genebank standards, ISTA standards and other relevant requirements. The processes for operating the genebank and the structures are in place. While the structures, processes, records and lists are in place, the team seem to struggle with the build up of backlogs, old or no equipment, low functionality of the rooms and the labs, and not least lack of management hours to oversee and prioritize functions and operations.

There were found to be too large backlogs with more than 70 % of the seeds that need to go in regeneration, germination tests and/or drying of seeds. These unsolved tasks should be given high priority and plans for how to solve them are recommended to be prioritized immediately.

In general, we found that all rooms of the genebank had too many functions and made it difficult to organize and get an overview of the work. The germination lab was found to also conduct tasks that would not normally belong to a laboratory and could cause contamination. Further, it was observed that the seed cleaning was not done well enough, leaving dead and damaged seeds in seed lot that was going to be stored. Better monitoring of the quality after seed cleaning and better equipment should be investigated.

The genebank was found to work on its own protocols for germination of wild and semi-wild species. It is beneficial that the genebank build up knowledge to be able to test the viability of the seeds. However, it should be noted that germination protocols for wild species often are to be obtained from other institutes like Kew Millenium Seedbank in the UK or the Hungarian National Centre for Biodiversity and Gene Conservation (NBGK). It was found that the germination, incubators were well suited for the purpose as temperature and light intensity can be adjusted for species' needs. We also found great knowledge of ISTA standards used for crops in both laboratories.

The genebank has rightly prioritized getting the seeds dried down to the required minimum to ensure high viability of the seeds and enable them to be stored and conserved for short and long-term. Unfortunately, there is a very large backlog of undried seeds from the past 3 years harvest or donations. This long process will most likely have very negative consequences for the longevity of the seeds. It was observed that the drying possibility of seeds is unsatisfactory, and it is recommended that it should be handled immediately. The humidity in the room for drying seeds is too high as there is also work undertaken in the room. The seed drying chambers seem not to be working correctly and are very slow. It is judged that the capacity for drying is too low.

The storages are extremely old and not suitable for the purpose. We found it positive that there are foreseen changes to this. It is very positive that there are plans for storing all accessions in minus 18°C. Today, accessions are stored in different size glass jars and sealed with cork or normal jar toppings. Moving towards aluminium foil packs seem to be a very good future prof solution.

The below recommendations cover germplasm management and our findings:

Recommendation 16

Immediately take action to improve the processes and ensure high quality of seed cleaning.

Improve the information on the condition for seed handling by introducing silica gel into the packages/glasses and regular cleaning between handling seeds.

Recommendation 17

Consider increasing efficiency and the operations by change into more optimal workflows, equipment and the general functionality of all rooms and activities of the genebank.

Consider to re-organize the rooms and turn the laboratories into dedicated spaces for their purpose.

Recommendation 18

Be aware that the threshing container is unsuitable for the purpose.

Recommendation 19

Consider setting the minimum germination rate to 85%, regardless of the initial germination level.

Recommendation 20

Immediately improve conditions for drying seeds. Consider using mesh bags for drying seeds as it allows a better airflow

Recommendation 21

Consider introducing and monitor the measurements of relative humidity (RH) in the seed chambers and bring the RH down to 60-65 % or lower to avoid icing in the cooling system and improve storage conditions for the seeds.

Recommendation 22

Consider contacting genebanks that have sent Black boxes to avoid storing obsolete materials for others.

Regeneration

AGES has their main regeneration site at their premises and the genebank also operates with strong internal connections within the Institute. They currently store 5873 accessions from which more than 4800 are crop plants (160 species) and more than 850 are medicinal and aromatic plants (460 species). They manage to regenerate 230-250 accessions on yearly basis and they maintain 170 accessions in vegetative growth. Since their local regeneration site has limited capacities compared to the number of accessions and amount of staff, some part of the accessions are being sent out to other branches of the institute (8 research stations and 13 genebanks) for regeneration. Within this internal network of research stations, possibilities are given to send out material to a relevant biogeographical region which fits for certain plants' needs. In case the material is regenerated on other stations, they take care that the same quality protocols are applied. To extend these collaborations is part of the short-term planning and is in progress.

Making the decision over what is to be regenerated is not an automatized process, it is done by person, based on the information in the database (GeRDa). According to their standards they define a threshold of min. 3000 living seeds for cross-pollinators and 1500 living seeds for self-pollinators.

Whenever the number of seeds/ accession drops below these thresholds they prepare the accession for regeneration. In regard to germination rates, they keep min. 80% for cultivated species and 60% for wild species at the moment, however the initial rate was 85%. They do the monitoring of germinability with standardized tests based on ISTA, ECPGR and scientific researches. Due to various reasons they have a large backlog of germination testing and regeneration, which need to be prioritized.

For the regeneration processes on site they have the equipment and technology to operate with high quality and efficiency. They are equipped with two high quality greenhouses (a glasshouse and a screenhouse) where pre-sowing and acclimatizing can be done. In the glasshouse, temperature and light conditions can be adjusted and monitored.

They use standardized bed-sizes for regeneration and do most of the field operations (sowing, phytosanitary applications, irrigation) manually. They operate with min. 40 plants per accession if available and apply crop rotation in the garden. For isolation they implement distance-planning and paper bags, for enhance pollination they keep some beehives on site.

Phytosanitary applications are well documented and adjusted on species level. All operations carried out on each accession can be tracked in details. Documentations also being done regards C&E data, which data is imported to the website for availability. The search engine of their public accession list also operates with these data as filtering options.

They employ a dedicated horticultural engineer in the garden but almost all other staff members are taking part in the fieldwork if needed, which leads to concerns regards defined leadership and responsibility. In high-season they also employ students as temporary workers, however sometimes especially in spring they run out of capacity of human-resource and they use herbicides (glyphosate) for weed control.

Recommendation 23

Consider having one dedicated person in charge of the greenhouses and garden

Try to engage more students/temporary workers especially in spring season when most of the preparations and sowings are being done

Recommendation 24

Fertilization efforts on accession level could be reduced significantly with fertilizing the garden once a year using organic manure or compost. It would also improve soil conditions on a long run.

Recommendation 25

Since the garden on the AGES premises is quite small, herbicides could be entirely absent and weed control could be done manually with better organisation.

Recommendation 26

The garden has a large unused capacity (large grassy areas and old orchards) which could also be used for regeneration with better planning.

Documentation

AGES presented that they are operating with a well-structured database embedded and managed in Microsoft Access. The database is well equipped, covering all genebank functions, accessions and history data is easy to be traced. Data of available seeds is mirrored entirely in EURISCO and Genesys platforms easily, based on the original structure.

The Genebank runs its own Youtube channel to communicate about their projects and missions to the public and to enhance more the external communications is planned.

Recommendation 27

Take advantage on the Institutional structure and involve the Department for Communication more in the genebank activities.

Final remarks

The reviewers were grateful for the preparation and the positive atmosphere and transparency presented by the hosts. Discussions were open and fruitful. This was very much appreciated.

The genebank holds a huge potential for future developments and increased importance for Austrian food and agriculture. The internal structures of how to operate a genebank is in place due to the comprehensive quality management system and a good understanding the operations and standards for a genebank. The positive national, regional and international collaboration is also on a very productive path. To realize the potential of the genebank and move on to the next level, it will be of outmost importance to solve the backlogs, allocate sufficient funding and prioritize management of the genebank.

May 30, 2025

The reviewers: Attila Simon, Csaba Péterfy, Bence Mala and Lise Lykke Steffensen