Supplemental data for

van Hintum, T., Balding, S., Desheva, G., Dickie, J., Díez, M. J., Guasch, L., Hauptvogel, P., Holubec, V., Janovská, D., Lohwasser, U., Martín, I., Papoušková, L., Schierscher-Viret, B., Steffensen, L. L., Uzundzhalieva, K., Vaccino, P., Valcárcel, J. V. (2025). Genebank Peer Reviews: A powerful tool to improve genebank quality and promote collaboration. *Genetic Resources* 6 (11), 115–121. doi: 10.46265/genresj.OADZ7911.

Contents

Supplemental Material 1. Operational Genebank Manual - Template used for Genebank Peer Reviews. Version March 2025

General instructions for the use of the template

You are requested to also respond to those questions that are not applicable to your genebank by stating “n.a.”, i.e. not applicable, in order to be sure that the question has not just been forgotten.

As for a number of activities you might be referring to protocols that you use it would be important to either refer to a published protocol (in that case please provide a complete literature reference) or to include the URL where the protocol can be consulted, if online available. Also in cases where you or your colleagues are basing practices on long-term experiences and “traditions” it would be helpful to indicate whether and where such practices have been described.

As it can be foreseen that genebank manuals will require regular updating due to the dynamic circumstances we are working under it would be important to note the date of compilation.

0 Date of compilation

0 Day/month/year

1 Germplasm Acquisition and Accessioning

Genebanks can obtain the germplasm they want to conserve through a number of different ways. Conducting collecting missions is possibly the best way of acquiring germplasm material in the most reliable manner. Germplasm exchange with other genebanks is a third route to add genetic diversity to the collection. Obtaining and storing germplasm from researchers and plant breeders is another route to acquire genetic material. Such acquisitions should be guided by a formal mandate that the genebank concludes with its host organization or government and that provides the basis for a genebank acquisition policy. The actual accessioning of acquired germplasm samples, i.e. formally including it into the collection with its unique accession number, is a complex process during which the curator has to check a number of aspects such as the verification of the identity of the material, the health status, the availability of pertinent information, etc. It is further understood that also legal aspects form part of this activity, e.g. was the material collected/obtained in legal manner, are there any restrictions on its use, etc.

1.1 Germplasm Acquisition and Accessioning

GA1 Briefly describe any formal mandate that your genebank might have concluded with or received from your "mother organization" (e.g. institute, governmental body).

This description should include details on:
a) which species you conserve and make available;
b) who decides on what your mandate is and, if different,
c) from whom do you received the mandate;
d) the main aspects of the mandate; and
e) legal considerations on PGR as foreseen in national legislation).

GA2 Specific agreements. Does your genebank have any specific formal agreements with other genebanks regarding the conservation of specified germplasm?

This should include:
a) whether or not your genebank has any international agreements to conserve specified germplasm on behalf of other countries,
b) a specific region, and/or
c) the world), and
d) which crops or genepools fall under these agreements?

GA3 In case your genebank has a germplasm acquisition policy, what does the policy entail?.

a) please specify which crops or which geographic area, if applicable.

GA4 How do you verify the identity of the germplasm material received (e.g. relying on the donor's information, comparing material with other accessions, involving (taxonomic) expertise, etc.)?

GA5 Describe if and how you conduct an assessment of the various quality aspects of the seeds, tissue culture or plant material received.

This description includes:
a) quality aspects related to the correct identification of a given accession, but also
b) health
c) purity aspects of the sample/accession), and
d) use of a quality control system (e.g. ISO).

GA6 Describe whether and how the SMTA is being implemented

a) Extent of materials covered by SMTA (crops, numbers of accessions)
b) Ways of SMTA implementation and documentation of transfers of PGR
c) Other aspects (e.g. monitoring, supervision)

1.2 Germplasm Collecting

GC1 Describe here the details of the strategy that you follow in implementing germplasm collecting missions.

This description should include:
a) general aspects of planning and implementing a collecting mission,
b) the criteria you use for priority setting;
c) the actual strategy followed in sampling material from farmers' fields, from nature, etc.; and
d) how your germplasm acquisition policy underpins the mission.

GC2 Provide any additional information on the germplasm collecting activities of your genebank, including the collaboration with others.

2 Ensuring Security

This chapter refers to the security of the genebank structure itself (i.e. its physical security), the safety of its germplasm (i.e. the maintenance of viability) as well as the institutional and personnel security, aspects which together will ensure the long-term conservation of the entire collection.

2.1 Physical Security

To ensure the physical security of the collections, the following aspects are regarded as essential elements for achieving the objective:

2.1.1 Safety Duplication (of long-term conserved germplasm)

SD1 Please describe how your genebank implements the safety duplication of your germplasm material.

This description should include the following aspects:
a) The type of safety duplication (e.g. black-box; no specific arrangement; other);
b) The location(s) where you store your safety duplicates (country; genebank);
c) Whether or not you are using a formal agreement with the genebank(s) that store your duplicates?
d) Whether the safety duplicates are stored under conditions comparable to your own? Please provide details;
e) Do you maintain safety duplicates from other genebanks at your genebank? If so, do you know any details of that material?

SD2 Do have a safety duplication policy? If so, please provide essential details.

2.1.2 Structure

SS1 Please provide details on how your genebank building has been designed to resist natural disasters (e.g. earthquakes; flood; storm).

SS2 Please describe the security arrangements that you have in place to protect your genebank against burglars, fire and others.

Please include details on the following arrangements, as applicable:
a) Fences;
b) Security doors;
c) Alarm system;
d) Fire detectors;
e) Standby generator;
f) Others (please specify.

SS3 Please provide information on any other structural security aspects that you might have in place.

2.1.3 Security Equipment

SE1 Provide details on the kind of emergency (back-up) equipment or arrangements that you have in place to ensure permanent electricity and cooling.

Aspects to consider are:
a) “back-up” compressors for your cold rooms;
b) generator;
c) regular maintenance and trial runs;
d) other.

SE2 Describe how you monitor temperature and relative humidity in your cold stores and drying room?

2.1.4 Institutional and Personnel Security

IPS1 Provide details on the “institutional security”, in particular with respect to the provision of financial means to operate the genebank

Aspects to consider are:
a) timely transfer of funds from the “mother” organization to the genebank;
b) do you have direct access to the “mother” organization that provides the budget?;
c) internal “security” of accessing these funds;
d) long-term security and stability of funding (compensation of inflation rates, avoiding variation in years)
e) any other observations that are relevant in this context.

IPS2 Describe how you secure adequate staffing of your genebank?

2.1.5 Contingency Plans

CP1 Describe the kind of emergency or contingency plan that your genebank has in place to cope with disaster situations.

CP2 Provide information on the kind of training, security drills and other activities that your genebank gives to its staff to deal with emergency situations, if any.

3 Germplasm Maintenance

This chapter deals with key aspects of managing germplasm in a genebank, i.e. the maintenance of the viability, the genetic integrity, the availability of the conserved germplasm as well as the management of the corresponding information. Given the fact we are covering seed, in vitro cultures and entire plants it might well be that not all aspects are covered by one and the same genebank. In those cases it is suggested that only the applicable sections are completed. Accordingly, at the beginning of each section of this chapter you will find a "navigation box" (highlighted in yellow) that will help you as user of the template to complete the correct section(s).

3.1 Maintenance of Viability

This section refers to the maintenance of the longevity of the seeds or of tissue cultures or living plants in storage. A high initial viability is the most important pre-condition for achieving the longest lifespan of seed accessions in storage, hence maximum efforts need to be taken to ensure that seeds to be stored have the highest possible viability. Optimum growing conditions when multiplying/regenerating the accessions, efficient management of the preparatory steps before storing the germplasm, adequate storage conditions as well as proper monitoring of the viability are critically important.

Navigation on Maintaining Viability section

Seed - If applicable, please complete the section on Maintaining Viability for the activities related to seed genebanks (i.e. boxes 3.1.1.A - 3.1.3.A)

In vitro cultures - If applicable, please complete the section on Maintaining Viability for the activities related to in vitro culture (i.e. boxes 3.1.1.B - 3.1.3.B

Cryopreservation - If applicable, please complete the section on Maintaining Viability for the activities related to cryopreserved collections (i.e. boxes 3.1.1.C - 3.1.3.C)

Field genebanks - If applicable, please complete the section on Maintaining Viability for the activities related to field genebanks (i.e. boxes 3.1.1.D - 3.1.3.D.

Seed Collections

3.1.1.A Initial seed viability

IV1 Describe the procedures or practices that you have in place to ensure the highest possible initial viability of your seed, in particular during regeneration and post-harvest (e.g. cultivation practices, pollination aspects, use of specific equipment as shelters, storage of harvested seeds, cleaning, etc.).

IV2 Describe procedures how you deal with a) dormancy and b) hard seeds?

IV3 Please provide any other information on procedures that you follow to ensure highest possible initial viability.

3.1.2.A Seed Viability Monitoring

VM1 Describe the routine seed viability monitoring system that you use.

The monitoring system should include the following aspects:
a) frequency of testing;
b) sampling method applied;
c) any thresholds that you use;
d) whether you apply different procedures for crops/species with erratic initial viability or irregular viability lifespan;
e) etc.

VM2 Please describe the information "system" that you might have in place that allows you to make more species or even accession-specific decisions when the next monitoring should take place.

VM3 Please provide information on non-specific thresholds that you might use for viability of seeds (i.e. percentage of germination) and for the amount of seeds left of an accession to initiate regeneration? In case you differentiate between self- and outbreeding species, please answer for each category separately.

3.1.3.A Seed Storage Conditions (for the different types of collections, i.e. short/medium- or long-term storage)

SC1 Please provide details on temperature and relative humidity conditions of your storage and drying rooms. In case they vary from room to room, please provide details for each.

SC2 Provide details on the type of containers and the packaging procedures (and the corresponding equipment, if any) that you use.

SC3 What is the range of seed moisture contents (smc) of your stored seeds of different species; what measures do you apply to keep and/or monitor the (low) moisture level? Do you treat different species differently?

SC4 Provide data on the total storage capacity (number of containers, number of accessions) and an estimated percentage to which extent this capacity has been filled.

SC4 Please include any other aspects regarding storage conditions at your genebank that you regard as important (e.g. anticipated lifespan of freezing and drying equipment and related prudent financial management).

In vitro Culture Collections

3.1.1.B Initial viability

IV1 Describe the procedures or practices that you have in place to ensure the highest possible initial viability of your plant material, in particular during culture of donor plants (e.g. cultivation practices [field, greenhouse], phytosanitary pre-treatments, like use of pesticides).

IV2 Describe procedures of explant isolation (organ source in the plant, manipulations) and sterilization (chemical and handling) of the explants.

IV3 Please provide any other information on procedures that you follow to ensure highest possible initial viability.

3.1.2 .B Viability Monitoring

VM1 Describe the routine in vitro viability monitoring system that you use.

The monitoring system should include the following aspects:
a) regular control of contamination events,
b) control of hyper-hydricity,
c) control of health state (if different from a above),
d) etc.

VM2 Describe the information “system” (i.e. an “expert system”) that you might have in place that allows you to make more species or even accession-specific decisions when the next monitoring should take place.

VM3 Please provide information on non-specific thresholds that you might use for vigor of in vitro cultures (i. e. multiplication rates, loss by weak growth) and for the amount of culture vessels (tubes, jars) left of an accession to initiate additional multiplication measures?

3.1.3.B Storage Conditions (for the different types of collections i.e. short/medium- or long-term storage)

SC1 Please provide details on light, temperature and relative humidity conditions of your culture and storage rooms, as applicable. In case they vary from room to room, please provide details for each.

SC2 Provide details on the type of cultivation vessels (tubes, jars plastic vessels etc.) and the transfer procedures (including the corresponding equipment, if any) that you use.

SC3 Please include any other aspects regarding in vitro culture and storage conditions at your genebank that you regard as important.

Cryopreserved Collections

3.1.1.C Initial viability

IV1 Describe the procedures or practices that you have in place to ensure the highest possible initial viability of your cryopreservation explant (source: in vitro pre-culture or directly from in situ explants), sterilization and explant isolation.

IV2 Please provide any other information on procedures that you follow to ensure highest possible initial viability (e.g. elimination of virus diseases).

3.1.2.C Viability Monitoring

VM1 Please indicate whether (and if so when and how) you perform random viability tests after the initial viability test? [see also VM3 below]

VM2 Please describe the information “system” that you might have in place that allows you to make more species or even accession-specific decisions.

VM3 Indicate for the initial regeneration control,

a. what is the percentage of regenerated control explants relative to the total number of explants per accession;
b. any thresholds that you use [e.g. discard the material as not storable below a certain regeneration rate of the control],
c. whether you apply different procedures for accessions with erratic regeneration rates of the control [e.g. increase the amount of explants stored]; etc. and

3.1.3.C Storage Conditions (for the different types of collections i.e. short/medium- or long-term storage)

SC1 Please provide information on the general system used for cryopreservation (liquid nitrogen or vapor phase, automatic tank filling or filling by hand). In case they vary from tank to tank, please provide details for each.

SC2 Provide details on the type of cryopreservation tanks and storage system within the tank that you use.

SC3 Do you treat different species differently?

SC4 Please include any other aspects regarding storage conditions at your genebank that you regard as important.

Field Genebank Collections

3.1.1.D Initial viability

IV1 Describe the procedures or practices that you have in place to ensure the highest possible quality of your planting material, in particular during the growing from donor plants (e.g. cultivation practices in the field or greenhouse], phytosanitary pre-treatments, etc.).

IV2 Describe any particular procedures you use (e.g. which organ of the donor plant you use to reproduce the planting material).

IV3 Please provide any other information on procedures that you follow to ensure highest possible initial quality.

3.1.2 .D Viability Monitoring

VM1 Describe the routine field genebank monitoring system that you use.

The monitoring system could include the following aspects: regular control of disease or pest contamination, other types of damages to the plants, etc.

VM2 Describe the information “system” that you might have in place that allows you to make more species or even accession-specific decisions when the next monitoring should take place.

VM3 Please provide information on non-specific thresholds that you might use for the quality of the individual plants (e.g. loss by weak growth) and for the amount of plants of an accession left in the field before additional initiating multiplication measures?

3.1.3.D Maintenance Conditions

SC1 Please provide details on your cultural practices (e.g. cultivation practices; pruning; irrigation; protection against animals etc.; pest and disease management; etc. applied to your field genebank material.

SC2 In the case of annual or sub-perennial species that cannot over-winter in the field genebank, what measures do you take?

SC3 Please include any other aspects regarding field genebank maintenance conditions at your genebank that you regard as important.

3.2 Maintaining Genetic Integrity

Maintaining the genetic integrity of an accession can be achieved by minimizing genetic drift which may occur predominantly during the process of regeneration, due to too small numbers of individuals being planted, sub-optimal pollination and/or the introgression of alleles from other accessions or commercial crops or crop wild relatives. The following aspects are important and for achieving the objectives of maintaining genetic integrity and should be briefly described. Please note that a distinction should be made between seed numbers for an accession and seed numbers for sub-samples per accession. The latter only applies if the seeds of a given accession are being stored and distributed as sub-samples. As genetically modified materials get more widely distributed and as it might have specific (legal, technical, administrative) requirements a separate box on this type of material is included.

For in vitro cultured and cryopreserved material, which are normally maintained as clones, genetic stability is as important as genetic integrity of the seed-stored material.

Navigation on Maintaining Genetic Integrity section

Seed - If applicable, please complete the section on Genetic Integrity for the activities related to seed genebanks (i.e. boxes 3.2.1.A - 3.2.5.A)

In vitro cultures - If applicable, please complete the section on Genetic Integrity for the activities related to in vitro culture (i.e. boxes 3.2.1.B - 3.2.3.B

Cryopreservation - If applicable, please complete the section on Genetic Integrity for the activities related to cryopreserved collections (i.e. boxes 3.2.1.C - 3.2.3.C)

Field genebanks - If applicable, please complete the section on Genetic Integrity for the activities related to field genebanks (i.e. boxes 3.2.1.D - 3.2.3.D

Seed Collections

3.2.1.A Seed Containers and Sample Size

SCSS1 Do you document the initial number of seeds of individual accessions (either as received from collecting missions or through exchange)?

SCSS2 Please describe what kind of containers (and equipment) you use, the procedure you follow with respect to sub-sampling, seed numbers per container, etc.

SCSS3 What is the number of seeds that you use as the minimum threshold per accession? Are these seed numbers of a given accession based on genetic parameters (such as reproduction biology; heterogeneous samples)? Please provide URL of your protocols if these are on-line available

SCSS4 Please provide details on other aspects that are important in this context.

3.2.2.A Pollination Control

PC1 Please describe the regeneration procedures that you follow for self- and outbreeding species.

Please include in your description the following aspects:
a. Any control measures to minimize or avoid cross pollination between accessions;
b. The use of pollination cages for insect pollinated species;
c. The use of specific pollinators for insect pollinated species;
d. Strategies to ensure that males and females participate equally in the reproduction).
e. Strategies to avoid any genetic drift (minimum number of plants, minimum number of plants at flowering stage before pollinators introduction, similar quantity of seeds harvested from each plant, etc.

PC2 - Provide any other relevant information on procedures that you apply to control pollination of your germplasm.

3.2.3.A Regeneration Environment and Procedures

RE1 Describe the regeneration environment and conditions that you apply. If applicable, you might want to distinguish between different types of germplasm (e.g. wild relatives, landraces, modern varieties, breeding material, genetic stocks, etc.).

Consider the following aspects:
a. In how far are the environmental conditions of the current regeneration of individual germplasm accessions comparable to the environmental conditions that existed at the original collecting or breeding site?;
b. Do you use controlled environments?;
c. Do you collaborate with other genebanks in Europe?;
d. others.

RE2 Please include any other relevant points on regeneration environment.

3.2.4.A Seed Processing Procedures

SPP1 Describe the protocol(s) that you use for threshing and seed cleaning. .

SPP2 Describe the protocol(s) that you use for seed drying, including whether you use different drying procedures for different types of species.

SPP3 Please describe how you keep the time between harvesting and the actual (long-term) storage of seeds as short as possible.

SPP4 Please describe how and where you store (in a temporary manner) newly harvested seeds.

Please provide details on the temperature and relative humidity of the storage room/space; what type of containers do you use, if any.

SPP5 Describe the criteria you use to decide on seed quantity per accession for the long-term storage.

3.2.5.A Genetically Modified Material

GMM1 In case you treat GMO material differently from "normal germplasm", please provide here the details for each of the deviating procedures (and equipment).

GMM2 Describe the policy and procedures (if any) in your genebank, related to ensuring that distributed samples are not containing GMOs.

In vitro Culture Collections

3.2.1.B In vitro Culture Vessels and Sample Size

SCSS1 Indicate if you document the initial number of explants of individual accessions when culture is initiated (from one or from more clonal donor plants)?

SCSS2 Please describe in general terms the type of culture vessels (as far not already done in section SC2 in 3.1.3.B), media and phytohormones you use as well as the procedures you follow with respect to cutting technique, callus exclusion, etc.

SCSS3 Please indicate whether or not you use a minimum number of in vitro plantlets per accession?

SCSS4 Please provide details on other aspects that are important in this context.

3.2.2.B In vitro Culture Procedures

SPP1 Describe the numbers of sub-clones you may cultivate per accession (assuming that this is not crop specific)

SPP2 Describe the sub-culture duration (if not crop specific)

SPP3 Describe the criteria you use to decide on in vitro plant quality (if not crop specific).

3.2.3.B Genetically Modified Material

GMM1 In case you treat GMO material differently from "normal germplasm", please provide here the details for each of the deviating procedures (and equipment).

Cryopreserved Collections

3.2.1.C Cryopreservation Containers and Sample Size

SCSS1 Indicate if you document the initial number of explants of individual accessions?

SCSS2 Please describe what kind of cryopreservation vessels (and equipment) you use (only if they differ from the corresponding answers in previous boxes), the procedure you follow with respect to separate material containing viruses or bacteria from healthy material

SCSS3 What is the number of explants that you use as the minimum threshold per accession?

SCSS4 Please provide details on other aspects that are important in this context.

3.2.2.C Cryopreservation Procedures (as long as not crop specific)

SPP1 Describe the protocol(s) that you use for preculture and pretreatment such as cold acclimation and dehydration.

SPP2 Describe the protocol(s) that you use for cryopreservation proper (such as slow freezing, droplet freezing, vitrification, encapsulation etc.)

SPP3 Describe the protocols that you use for regeneration (slow or fast rewarming, washing, dark periods etc.)

SPP4 Describe the time span and method(s) of survival and regeneration controls

SPP5 Describe the criteria you use to decide on explant quantity per accession for the long-term storage.

3.2.3.C Genetically Modified Material

GMM1 In case you treat GMO material differently from "normal germplasm", please provide here the details for each of the deviating procedures (and equipment).

Field Genebank Collections

3.2.1.D Accession Sample Size

SCSS1 Indicate if you document the initial number of plants of individual accessions (either as received from collecting missions or through exchange)?

SCSS2 Please describe what kind of procedures you follow, if any, with respect to sub-sampling and subsequent place/container/etc. of maintenance?

SCSS3 What is the number of plants that you use as the minimum threshold per accession? Are these plant numbers of a given accession based on genetic parameters (such as reproduction biology; heterogeneous samples)?

SCSS4 Please provide details on other aspects that are important in this context.

3.2.2.D Multiplication

PC1 - Please describe the multiplication procedures that you follow for your field genebank material (both, annual as well as perennial species)?

Please include in your description the following aspects if they would apply to your field genebank management procedures:

a. Any control measures to minimize or avoid cross pollination between accessions (if applicable/relevant);
b. The use of pollination cages for insect pollinated species;
c. The use of specific pollinators for insect pollinated species;
d. Strategies to ensure that males and females participate equally in the reproduction).
e. Strategies to avoid any genetic drift (minimum number of plants, minimum number of plants at flowering stage before pollinators introduction, similar quantity of seeds harvested from each plant, etc.

PC2 Provide any other relevant information on procedures that you apply to control pollination of your germplasm in case of harvesting planting material from your field genebank material?

3.2.3.D Planting Material Processing Procedures

SPP1 Describe the protocol(s) that you use for threshing and seed cleaning, if used as an intermediate step for the management/multiplication of your field genebank accessions

SPP2 Please describe how and where you store (in a temporary manner) newly harvested planting material.

Please provide details on the temperature and relative humidity of the storage room/space; what type of containers do you use, if any, etc.

SPP3 Describe the criteria you use to decide on the number of plants per accession intended for the long-term conservation.

3.3 Ensuring Availability

An important objective of conservation efforts is to facilitate the effective utilization of germplasm accessions by researchers, breeders and farmers. Thus, ensuring the ready availability of stored germplasm is an important principle. It refers to the ability of genebanks to supply and distribute the stored germplasm, together with any associated information, in an adequate way to users. Aspects that can affect the availability include: (a) policies, (b) seed stock, (c) health status of accessions, and (d) distribution quantity. Although most of the questions are not relevant in the ECPGR/AEGIS context, it was decided to keep the questions and to allow for a comprehensive genebank manual that can be used "globally".

Navigation on Ensuring Availability

Seed - If applicable, please complete the section on Ensuring Availability for the activities related to seed genebanks (i.e. boxes 3.3.1.A - 3.3.4.A)

In vitro cultures - If applicable, please complete the section on Ensuring Availability for the activities related to in vitro culture (i.e. boxes 3.3.1.B - 3.3.4.B

Cryopreservation - If applicable, please complete the section on Ensuring Availability for the activities related to cryopreserved collections (i.e. boxes 3.3.1.C - 3.3.4.C)

Field genebanks - If applicable, please complete the section on Ensuring Availability for the activities related to field genebanks (i.e.boxes 3.3.1.D - 3.3.4.D

Seed Collections

3.3.1.A Ensuring Availability of Germplasm - Policy Aspects

AGP1 Describe the germplasm distribution policy that you follow at your genebank.

You might want to consider in your response the following aspects:
a) crop/species specificity;
b) whether or not sufficient seed stock is available; who the requestor is;
c) what the purpose of the germplasm request is;
d) any restrictive conditions and/or
e) the total amount of accessions sent per request for distribution of germplasm;
f) use of a formal agreement to distribute the germplasm.

AGP2 Do you have as part of your service rendering policy aspects such as a “maximum time” between receiving a germplasm request and distribution of the germplasm?

AGP3 Describe how you treat “related information” about the requested accessions that you make available to the requestor, i.e. provide details on the typical information you send out with the germplasm.

3.3.2.A Ensuring Availability of Germplasm - Seed/Germplasm Stock Aspects

AGSS1 Please provide details on the minimum/maximum amount of seed, plant, in vitro samples that you distribute (where relevant, differentiated by species groups, i.e. self-pollinating, cross-pollinating and/or whether an accession is homo- or heterogeneous).

AGSS2 Describe how you store the seeds/etc. of a given accession with respect to the use of single or multiple bags or containers per accession.

AGSS3 Describe how you manage the availability of adequate seed/etc. stock per accession, including the use of an absolute lower minimum of seeds per accession as the threshold to decide to regenerate.

AGSS4 Provide here information on any other aspects that are relevant to manage seed/etc. stocks.

3.3.3.A Ensuring Availability of Germplasm - Health Aspects

AGHA1 Describe how you store seed/other germplasm with respect to germplasm health considerations, including whether you have a “policy” of storing only “disease free” (as far as you can see or determine) accessions, at least for the quarantine pests and diseases.

AGHA2 Describe how you follow plant quarantine rules and regulations when exporting germplasm abroad (especially to countries at another continent).

AGHA3 Describe if and how you distribute germplasm accompanied by a phytosanitary certificate or a “plant passport”.

AGHA4 Provide any other relevant information on procedures that you follow with respect to germplasm health aspects.

3.3.4.A Germplasm Supply

GS1 Describe the policy of your genebank with respect to the sample size that you use for distribution purposes, including whether you differentiate between germplasm from self- or outbreeding species, heterogeneous accessions, and possibly other aspects.

GS2 As GS1 above, but in case your germplasm samples do not possess the minimum viability, would you increase the number of seeds?

GS3 Please provide information on any other aspects related to seed supply.

In vitro Culture Collections

3.3.1.B Ensuring Availability of Germplasm - Policy Aspects

AGP1 Describe the germplasm distribution policy that you follow at your genebank.

You might want to consider in your response the following aspects: is the user informed about the option to get provided with in vitro cultures and whether they are available all the time of the year, are in vitro samples an option or the only way to get material; who the requestor is; what the purpose of the germplasm request is; any restrictive conditions and/or the total amount of accessions sent per request for distribution of germplasm; use of a formal agreement to distribute the germplasm.

AGP2 Indicate if you have as part of your service rendering policy aspects such as a “regular or a maximum time” between receiving a germplasm request and distribution of the germplasm?

AGP3 Describe how you treat “related information” about the requested accessions that you make available to the requestor, i.e. provide details on the typical information you send out with the germplasm.

3.3.2.B Ensuring Availability of Germplasm - Germplasm Stock Aspects

AGSS1 Please provide details on the maximum amount of in vitro samples that you distribute.

AGSS2 Describe how you store the samples of a given accession with respect to the use of vessels for culture and vessels for distributions (glasses of plastic bags).

AGSS3 Describe how you manage the availability of adequate plants per accession, including the use of an absolute lowest minimum of plants per accession as the threshold to decide to regenerate.

AGSS4 Provide here information on any other aspects that are relevant to manage stocks (e.g. transfer of material through greenhouse transfer phases in case a user cannot handle in vitro cultures).

3.3.3.B Ensuring Availability of Germplasm - Health Aspects

AGHA1 Describe how you store germplasm with respect to germplasm health considerations, including whether you have a “policy” of storing only “disease free” (as far as you can see or determine) accessions, at least for the quarantine pests and diseases.

AGHA2 Describe how you follow plant quarantine rules and regulations when exporting germplasm abroad (especially to countries at another continent).

AGHA3 Describe if and how you distribute germplasm accompanied by a phytosanitary certificate or a “plant passport”.

AGHA4 Provide any other relevant information on procedures that you follow with respect to germplasm health aspects.

3.3.4.B Germplasm Supply

GS1 Describe the policy of your genebank with respect to the sample size that you use for distribution purposes.

GS2 Please provide details of your routine methodology of containers etc. that you use to distribute in vitro cultures.

GS3 Please provide information on any other aspects related to in vitro plant supply.

C. Cryopreserved Collections

3.3.1.C Ensuring Availability of Germplasm - Policy Aspects

AGP1 Describe the germplasm distribution policy that you follow at your genebank.

Cryopreserved material is for distribution in exclusive cases only - e.g. for special research, please describe your policy; who the requestor is; what the purpose of the germplasm request is; any restrictive conditions and/or the total amount of accessions sent per request for distribution of germplasm; use of a formal agreement to distribute the germplasm.

AGP2 Indicate if you have as part of your service rendering policy aspects such as a “regular or maximum time” between receiving a germplasm request and distribution of the germplasm?

AGP3 Describe how you treat “related information” about the requested accessions that you make available to the requestor, i.e. provide details on the typical information you send out with the germplasm.

3.3.2.C Ensuring Availability of Germplasm - Germplasm Stock Aspects

AGSS1 Please provide details on samples that you distribute (where relevant).

AGSS2 Describe how you store, for distribution, the cryopreserved material of a given accession with respect to the use special equipment such as dry-shippers etc.

AGSS3 Describe how you manage the availability of adequate cryopreserved material.

AGSS4 Provide here information on any other aspects that are relevant to manage seed/etc. stocks.

3.3.3.C Ensuring Availability of Germplasm - Health Aspects

AGHA1 Describe how you store seed/other germplasm with respect to germplasm health considerations, including whether you have a "policy" of storing only "disease free" (as far as you can see or determine) accessions, at least for the quarantine pests and diseases. You could also add data on separation of differently infested material in separate cryotanks etc.

AGHA2 Describe how you follow plant quarantine rules and regulations when exporting germplasm abroad (especially to countries at another continent).

AGHA3 Describe if and how you distribute germplasm accompanied by a phytosanitary certificate or a "plant passport".

AGHA4 Provide any other relevant information on procedures that you follow with respect to germplasm health aspects.

3.3.4.C4 Germplasm Supply

GS1 Describe the policy of your genebank with respect to the sample size that you use for distribution purposes.

GS2 Please provide details of your routine methodology of containers etc. that you use to distribute cryopreserved material.

GS3 Please provide information on any other aspects related to cryopreserved material supply.

D. Field Genebank Collections

3.3.1.D Ensuring Availability of Germplasm - Policy Aspects

AGP1 Describe the germplasm distribution policy that you follow at your genebank.

You might want to consider in your response the following aspects: crop/species specificity; whether or not sufficient seed stock is available; who the requestor is; what the purpose of the germplasm request is; any restrictive conditions and/or the total amount of accessions sent per request for distribution of germplasm; use of a formal agreement to distribute the germplasm.

AGP2 Indicate if you have as part of your service rendering policy aspects such as a "maximum time" between receiving a germplasm request and distribution of the germplasm?

AGP3 Describe how you treat "related information" about the requested accessions that you make available to the requestor, i.e. provide details on the typical information you send out with the germplasm.

3.3.2.D Ensuring Availability of Germplasm - Seed/Germplasm Stock Aspects

AGSS1 Please provide details on the minimum/maximum amount of plants or organs (cuttings, bulbs, tubers, etc.) per plant that you distribute per accession (where relevant, differentiated by species groups, i.e. annual or perennial; woody or herbaceous; other) and/or whether an accession is clonally or sexually propagated).

AGSS2 Describe how you manage the availability of adequate organs per accession, including the use of an absolute lower minimum of plants per accession as the threshold to decide to multiply.

AGSS3 Provide here information on any other aspects that are relevant to manage plant material stocks.

3.3.3.D Ensuring Availability of Germplasm - Health Aspects

AGHA1 Describe how you maintain field genebank (and any intermediate storage step) accessions with respect to health considerations, including whether you have a "policy" on accepting/planting only "disease free" planting material (as far as you can see or determine) accessions, at least for the quarantine pests and diseases.

AGHA2 Describe how you follow plant quarantine rules and regulations when exporting germplasm abroad (especially to countries at another continent).

AGHA3 Describe if and how you distribute germplasm accompanied by a phytosanitary certificate or a "plant passport".

AGHA4 Provide any other relevant information on procedures that you follow with respect to germplasm health aspects.

3.3.4.D Germplasm Supply

GS1 Describe the policy of your genebank with respect to the sample size that you use for distribution purposes, including whether you differentiate between germplasm from annual or perennial species, clonally or sexually propagated accessions, and possibly other aspects.

GS2 Please provide information on any other aspects related to seed supply.

4 Providing Information

The lack of adequate information on a given accession may well decrease the value of that accession to the user. The information on individual accessions should be as complete as possible in order to facilitate the identification of duplicates and/or to select accessions with desirable characteristics. A genebank should have a documentation system in place that allows to optimize management of the collections as well as to provide access to information about the collection to users.

4.1 Genebank Documentation System

GD1 Please provide details on the technical aspects of the genebank information management system(s) that you use.

a) On which software is the system based (i.e. Oracle, Fox Pro, MS Access, MS excel, MS Word, other?).
b) In case you use a manual information management system, please provide details.
c) In case your "internal" database(s) is/are different from the publicly available database(s), please provide details on both,
d) Describe which activities of the genebank are covered by the system.

GD2 Provide details on which types of data you handle in your documentation system, e.g. passport data, characterization & evaluation data, cultivar data, material distribution etc.

GD3 In case your internal database(s) is/are different from the publicly available database(s), please provide details on both.

GD4 Describe in which form you send accession specific data (e.g. as hard copy, electronically - if the latter, please specify (in plain text) which file format, i.e. Excel, Access, others is used).

GD5 Provide information on how technical support for development and maintenance of the documentation system is arranged

GD6 Describe your genebank policy with respect to backing-up of the database contents, including with which frequency?

GD7 Provide any other information on your information management system that is not covered in one of the above questions.

4.2 Information Exchange

IE1 Please describe how you make your passport data available to users (i.e. as hard copy; via the internet; other?).

IE2 Please indicate if your data is available as machine to machine web-services. In case it is, describe

a) what types of data (passport data, characterization & evaluation data etc) and
b) which web-service interfaces are available (i.e. GBIF IPT, BioCase, TapirLink).

IE3 Please indicate if your data is published to EURISCO. Describe which data is published to EURISCO and at which intervals.

IE4 Please provide any other information on information exchange that is important for others to know.

IE5 Describe the kind of information you distribute together with the germplasm to persons that request germplasm?

Please consider the following data types: Passport, Characterization; Evaluation, and/or Germplasm management data (e.g. viability percentage; protocols followed for routine operations; etc..

Supplemental Material 2. Checklist for the Peer Review of Genebanks. Version March 2025

The checklist, largely based on the template for an Operational Genebank Manual, lists the topics to consider while reviewing. Section 0 'Organisation, Management and Funding' is new, for the others, the reported data in the Operational Genebank Manual, if available, can be used as a starting point of the discussion.

The checklists focuses on seed genebanks (especially section 3 'Germplasm Management'), a similar list can be made for other types of genebanks (field genebanks, in vitro and cryo-collections).

0 Organisation, Management and Funding

0.1. In what larger organisational structure is the genebank positioned and how, who is in charge, in what hierarchy?
0.2. How is the genebank organised internally; how many staff, what kind of positions? Who is responsible for staffing? Are there problems related to staffing?
0.3. How is the genebank funded, is the funding sufficient, was/is/will it be it stable?
0.4. Is it clear what the components of the programme cost, are all costs (office rent, computers, greenhouses, freezers, etc.) budgeted?

1 Germplasm Acquisition and Accessioning

1.1. What material is added to the genebank, is there a policy, who decides?
1.2. What criteria are there for the material to be allowed in in terms of seed amounts, phytosanitary and legal / administrative requirements ?
1.3. Does the genebank do collecting, and if yes, where, how and how often?
Are there documents to substantiate this?

2 Security

2.1. Is the material safety duplicated, if yes, what proportion and where?
2.2. How secure is the genebank? Think of earthquakes, fires, floods and other disasters.
2.3. Are there back-up generators, fire extinguishers, etc?
2.4. How is the temperature and humidity monitored, what happens if it deviates from the norms?
Are there documents to substantiate this or items to see?

3 Germplasm Management

Viability

3.1. What standards are applied regarding seed viability (for new seed or stored seed)? How is this measured/monitored; what are the protocols? How is dealt with dormancy/hard seededness, etc.? How are results recorded and analysed? Who does the tests and analysis?
3.2. How and when is it decided to regenerate an accessions; what are the criteria, and how quick is it actually done?
Are there documents to substantiate this or items to see?

Storage conditions

3.3. How is the seed material treated, packed and stored? What criteria for seed moisture are applied? What are the conditions in the drying and storage rooms, what containers are used?
3.4. How much storage space is available, what is the age of the facilities and how long is it expected to last?
3.5. Are there criteria for the seed amounts, how many seeds are distributed to the user?
Are there documents to substantiate this or items to see?

Regeneration

3.6. How are the accessions regenerated; who does it and on what scale? Are there regeneration protocols; what number of plants are used, crossing schema's, isolation, pollination, etc.? Is there sufficient access to isolation cages, etc?
3.7. How are phytosanitary issues tackled; is there a regular check from the authorities? How is the phytosanitary information handled?
Are there documents to substantiate this or items to see?

Seed Processing

3.8. What happens to the seed after regeneration? Are there protocols for these treatments (pre-drying, threshing, cleaning, drying, time between harvest and packing, etc)?

Availability

3.9. What is the policy regarding requests and distribution of material. Who can obtain material, under what conditions, how many accessions, how much seed, any restrictions, etc.? How long does it take from the request to the distribution?

3.10. How many samples are distributed annually and to whom (in the institute, in the country, abroad – public, private).

3.11. What paperwork comes with the requests (SMTA, passport/C&E data, phytosanitary, etc.)?

Are there documents to substantiate this or items to see?

4 Information

4.1. How is the genebank documentation handled (hardware, software, personal)? What procedures exist to manage the information system (collecting data, entering data, back-up, generating reports, making data available)?

4.2. What types of data are stored and how do they support genebank operations?

4.3. How is the information made available to users; is there a website? Is the information made available to other databases (such as EURISCO), how and in what intervals?

Are there documents to substantiate this or items to see?

Overall

For all these components; and possibly other arising issues following questions can be asked:

- What is the overall impression in terms of quality of the operation/facility/procedure.
- What are the strong and weak points.
- What improvements can be suggested, and how urgent are these?