

Best practices for genebank management data collection form

General guidelines: This format was developed to collect and gather updated and current recommendations on the best practices for genebank management for 8 target crops (please provide references whenever possible). Use one format per crop, first describing distinct procedures for each type of genebank (steps 2, 3 and 4 - add additional paragraphs for different methodologies) and secondly the common procedures (regardless of type of conservation, i.e. steps 1, 5, 6 and 7). Please specify special cases for genotypes or wild species that deviate from the normal crop behavior. This guideline was prepared for either seed or clonal crops; use only the subtitles relevant for your crop and add any additional information needed. This information must have enough detail so that the work can be repeated elsewhere.

The recommendation(s) of the best practices should first be **gathered** from other genebanks, then **compared, discussed** and **adapted** and finally **chosen** and **justified** into this data format. This justification should be clear, concise and simple. The recommendations of best practices can result in more than one best practices, taking in consideration different scenarios (different conditions and facilities) if applicable. Recommended best practices are not necessarily what the CGIAR centres are currently doing, but how genebank activities should be carried out, with the current technical knowledge.

The given format was developed in detailed boxes to prompt and facilitate the gathering of relevant information from the various contributors. This format will then be adapted/adjusted according to each crop, into the Knowledge Base website. There will be cases of headings that are not applicable for a specific crop. There will be therefore three choices when filing a heading (please write one of these choices for any heading):

- Applicable, and therefore should be filled.
- Not applicable for this crop.
- Information not known.

Please fill the information on the left column an the justification on the right column

We recognize that many of the best practices currently in use are likely to be those recommended from the Genebank Standards, 1994. FAO, IBPGR. If this is the case, please just refer to this document (or any others) in the justification column.

Ex situ conservation strategies: (Indicate which methods are used to conserve this crop and list the starting material for each)

a) Seed bank		
Starting material (seed category i.e. orthodox, intermediate, recalcitrant)	Best practices: Orthodox seeds	Justification: Seed behavior towards dehydration and temperature
b) <i>In vitro</i> bank	Not applicable	

[illegible]

A) Information required for Seed banks	
Step 2 – Sample processing in seed banks <i>(describe the general procedures used for this crop, to be stored under the above described method)</i>	
2.1 – Cleaning <i>(removal of physical contamination from the plant materials before it can be store)</i> <i>Include threshing, washing, sterilization, disinfestations and pre-treatments such as pre drying of seeds, seed moisture content determination)</i>	
Best practices: Threshing and blowing machine for big samples. Hand threshing and hand-purifying for small samples.	Justification: Optimal in terms of cost and quality
2.2 - Visual inspection of seeds <i>(describe recommended procedures for insect and fungal damage, mechanical damage and empty seeds)</i>	
Performed after fumigation.	Justification: Eliminate infested seeds
2.3 – Special treatments <i>(fumigation, dipping)</i>	
Best practices: Fumigation, 48 hours exposure to 57% aluminium phosphide	Justification: Clean from spores and insects
2.4 - Disposal of contaminated materials <i>(procedures to deal with infected or contaminated plant samples)</i>	
Best practices: No special recommendation	Justification:none
2.5 - Inspection and certification <i>(purity analysis of seeds)</i>	
Best practices: Comparison with seed file.	Justification: Check that newly harvested seeds look alike the original sample
2.6 - Seed drying <i>(describe recommended procedures)</i>	
Best practice:	Justification:
Method: Drying room 15% RH at 16°C±2 degrees	
Drying time: Depends on initial water content	Seed left in drying room till they reach optimal water content
Moisture content before drying: All accessions are entering the drying room by batch. For each batch, one reference sample per drying shelf is selected for water dehydration monitoring. Water	Allow dehydration monitoring

content is first check with seed moisture reader. Once reference sample reached optimal water content, water content is determined gravimetrically for all samples on the same shelf.	
Moisture content for storage: Performed on all samples prior processing	Optimize seed lifespan
Critical moisture content: 8%	Optimal water content for conservation
Others:	
2.7 – Recording information during sample processing <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Accession number	
Harvest Date (s)	
Date of introduction in fumigation room	
Date out of fumigation room	
Morphological comparison to seed file	
Date of entry in Drying room	
Location in Drying room	
Date sent for processing (i.e. water content, germination, packaging, storage)	
Date of automatic water content	
Number of seeds used for automatic water content	
Automatic water content	
Date of gravimetric water content	
Number seed used for gravimetric water content control	
Fresh weight (g) (for gravimetric)	
Grounded Fresh weight (g) (for gravimetric)	
Dry ground weight (g) (for gravimetric)	
Water content (gravimetric)	
Number seeds used for germination test	
Number seeds germinated	
Number vigorous seeds	
Moisture content (%)	
100 seed weight (g)	
Total weight harvested	
Number of seeds harvested	
Number seeds sent to medium term storage	
Number seeds sent to long term storage	
Number seeds sent to safe Duplication	
Number seeds sent to Svalbard	
Packaging batch	
Packaging terminated	
Rejected for packaging (yes or no)	
Reason for being rejected	
Number seeds sent to indexing	
Certified disease free (yes/no)	

Step 3 – Germplasm testing in seed banks <i>(describe the tests for quality, genetic integrity and fitness for this crop, of each type of seeds or plant materials to be stored under the above described method)</i>	
3.1 - Seed moisture content in seed banks	
3.1.1 - Seed moisture content determination methods	
Best practice:	Justification:
Sampling frequency: Automatic and gravimetric tests performed Automatic measurement performed with a seed moisture reader. Gravimetric: Based on fresh and dry weight of seed samples	Check optimal water content is reached prior entering storage conditions
Sample size: 20 to 50 seeds	
Grinding: Mechanical	
Oven drying temperature: 105°C	
Others: Aluminum cans Seed moisture reader is used to check water content fluctuations	
3.1.2 - Recording information during seed moisture content <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Automatic water content (when quantity of seeds allows)	Make sure dried samples do not re-hydrate during weighing (step to be performed quickly to avoid re-imbibition –keep samples in presence of silicagel if necessary).
Fresh weight before over	
Dry weight after oven	
3.2 – Viability testing in seed banks	
3.2.1 – Viability testing laboratory methods <i>(describe the various recommended options, taking into consideration various levels of technical expertise, equipment or laboratory conditions).</i>	
Best practice:	Justification:

Type of test: Germination test prior storage/viability test during storage	Check seed viability and predict its viability
No of seeds and replicates: 20	
Pre-treatment: Mencozeb coating	Prevent fungal contaminant
Media - Sterile distilled water on Seedburo K-22 germination paper	
Temperature: Between 22-30°C	
Light: Natural	
Duration of test: 11 days	Duration for seedlings to develop
Others: Data logger placed in germination room to monitor temperature	
3.2.2 – Monitoring intervals <i>(describe the recommended intervals for different storage conditions)</i>	
Best practices: 5 to 10 years Systematic check of samples stored for long period of time which initial record is unknown.	Justification: We do not have feedback on seed viability following our present processing (missing data for old samples such as initial water content, initial germination....)
3.2.3 - Recording information during viability testing <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	
Number of germinated seeds	
Number of contaminated germinated seeds (discarded)	
Number of non germinating seeds	
Number of vigorous seedlings (full development)	
3.3.1 – List pests and diseases of quarantine importance <i>(website links will be inserted here to similar outputs from activity 3.1)</i> DATA ALREADY PROVIDED BY MARIA AYODELE	
Pest	Region(s)
3.3.2 – Provide options for testing procedures <i>(considering various equipment and facilities scenarios, i.e. giving recommendations for various options)</i>	

Pest	Method
3.3.3 – Testing intervals/seasons (recommend the adequate times to perform each testing)	
Best practices:	Justification:
3.3.4 - Recording information during health diagnosis (list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)	
Data field name	Content
3.4 – Transgenes detection in seed banks (only important for those crops that have undergone transgenic events and where transgenic varieties had been used in the area of collection) - If you have already provided this information to Monica Mezzalama, please cut and paste the relevant information here.	
3.4.1 – List the current transgenes (for this crop in each major region of growth) (website links will be inserted here to similar outputs from activity 2.1.2)	
Transgene	Region(s)
Not performed	
3.4.2 - Transgenes determination methods (describe the general required tests for the genetic integrity of this crop, to be stored under the above described method)	
Transgene	Method
Not performed	
3.4.3 - Recording information during transgene detection (list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)	
Data field name	Content
Not performed	
3.5 – Storage monitoring in seed banks	
3.5.1 – Routine monitoring methods (describe the recommended monitoring methods for minimum viability and quantity of plant materials for the described storage method for this crop)	
Best practices: Germination test as described above	Justification: Check viability during storage

3.5.2 – Monitoring frequency <i>(List the minimum quantity and minimum viability of seeds below which they need to be regenerated)</i>	
Best practice:	Justification:
Critical quantity 500 seeds	
Critical germination level 50%	
3.5.3 - Recording information during storage monitoring in seed banks <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Same data as germination test describe above	
Step 4 – Conservation - Types of storage in seed banks	
4.1 - Base collections in seed banks <i>(In this section describe when, why and how should it be done; fill the information below for conditions and requirements)</i>	
Best practice: When total seed stock higher than 750 seeds (500 seeds minimum maintained in active collection from each new harvest)	Justification: Back up when active collection sample no longer available
4.1.1 - Sample specifications	
Best practice:	Justification:
Minimum sample size/viability for storage: 100	
Moisture content: 8%	
4.1.2 - Container specifications	
Best practice:	Justification:
Seed packaging method: Laminated foil under vacuum	Metabolism reduced to minimum
Specifications of packaging material:?	
4.1.3 – Storage specifications	

Best practice:	Justification:
Assigning location codes: yes	To retrieve sample from the bank
Storage conditions: -20°C	Reduced metabolism
4.2 - Active collections in seed banks <i>(In this section describe when, why and how should it be done; fill the information below for conditions and requirements)</i>	
Best practice: When should be used. Whenever one accession is stored	Justification: Used for distribution and multiplication
4.2.1 - Sample specifications	
Best practice:	Justification:
Minimum sample size/viability for storage: Not defined	
Moisture content: 8%	ISTA
4.2.2 - Container specifications	
Best practice:	Justification:
Seed packaging method: In plastic containers or under vacuum in laminated foil	ISTA
Specifications of packaging material:	
4.2.3 – Storage specifications	
Best practice:	Justification:
Assigning location codes: Yes	To retrieve germplasm easily
Storage conditions: 6°C±2 RH=25-30%	
4.3 - Safety duplication in seed banks <i>(In this section describe when, why and how should it be done; fill the information below for conditions and requirements)</i>	
Best practice: When should it be used When seed stock is high enough to duplicate the collection	Justification: To avoid irreversible germplasm loss
4.3.1 - Sample specifications	

Best practice:	Justification:
Minimum sample size/viability for storage: 250 seeds / 75% minimum	Allow at least one regeneration cycle
Moisture content: 8%	
4.3.2 - Container specifications	
Best practice:	Justification:
Seed packaging method: Under vacuum in laminated foil	Reduced metabolism
Specifications of packaging material:	
4.3.3 – Storage specifications	
Best practice:	Justification:
Assigning location codes in boxes: Yes and record location of the sample in the original genebank	Retrieve germplasm easily if needed
Storage conditions: -20°C	
Shipping method: Fast shipment (Fed ex, DHL)	
Legal arrangements: YesTOR between party	
4.4 - Storage space arrangement in seed banks <i>(recommend the best options, suggestions and practical hints for this crop)</i>	
Best practices: Where possible, same accessions split in different storage rooms with similar storage conditions.	Justification: To reduce the risk of losing all germplasm in case one storage room encounters problems (broke, thief, fire)
4.5 - System for tracking materials/inventory system in seed banks <i>(describe the best recommended methods as well as alternatives in case of limited conditions)</i>	
Best practices: Bar code and inventory system	Justification: Keep update inventory
4.6 - Recording information during conservation in seed banks <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Location in the store	

Type of storage (long/medium)	
Type of container	
Number of seeds	
Weight	
100 seed weight	
Germination monitoring	

E) Information required for Field banks **NOT APPLICABLE FOR IITA MAIZE**

Step 2 – Sample processing on field banks *(describe the general procedures used for this crop, to be stored under the above described method)*

2.1 - Source of material on field banks *(briefly describe how the materials should be collected and cleaned)*

Best practices:	Justification:
Pre-treatment Fumigation Insecticide application Others	
Propagation material to be planted Type of propagule	
Cleaning Washing Threshing Sterilization Disinfestations Others	

2.2 - Visual inspection of plant materials on field banks *(describe recommended procedures)*

Best practice:	Justification:
Insect damage Fungal damage Mechanical damage Empty seeds Others	

2.3 – Cleaning propagules on field banks *(removal of physical contamination from the plant materials before it can be store)*

Best practices:	Justification:
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Pre-treatment Fumigation Insecticide application Others	
2.4 - Disposal of contaminated materials on field banks <i>(procedures to deal with infected or contaminated plant samples)</i>	
Best practices:	Justification:
2.5 - Recording information during sample processing on field banks <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Step 3 – Germplasm testing on field banks <i>(describe the general required tests for quality, genetic integrity and fitness for this crop, of each type of plant materials to be stored under the above described method)</i>	
Best practices:	Justification:
3.1 – Health diagnosis on field banks <i>(describe the recommended methods for each type of plant materials in storage/planted) - If you have already provided this information to Cecilia Ynouye, please cut and paste the relevant information here.</i>	
3.1.1 – List pests and diseases of quarantine importance on field banks <i>(for this crop in each major region of growth) (website links will be inserted here to similar outputs from activity 3.1)</i>	
Pests	Region(s)
3.1.2 – Provide options for testing procedures on field banks <i>(taking in consideration various equipment and facilities scenarios, i.e. giving recommendations for various options) (website links will be inserted here to similar outputs from activity 3.1)</i>	
Pests	Method
3.1.3 – Testing intervals/seasons on field banks <i>(recommend the adequate times to perform each</i>	

testing)	
Best practices	Justification:
3.1.4 - Recording information during health diagnosis on field banks (list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)	
Data field name	Content
3.2 – Transgenes detection on field banks (only important for crops that have undergone transgenic events and where transgenic varieties had been used in the area of collection)	
3.2.1 – List the current transgenes on field banks (for this crop in each major region of growth) - If you have already provided this information to Monica Mezzalama, please cut and paste the relevant information here.	
Transgene	Region(s)
3.2.2 - Transgenes determination methods on field banks (describe the general required tests for the genetic integrity of this crop, to be stored under the above described method) (website links will be inserted here to similar outputs from activity 2.1.2)	
Transgene	Method
3.2.3 - Recording information during transgenes detection on field banks (list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)	
Data field name	Content
3.3 – Storage monitoring for field banks	
3.3.1 – Routine monitoring methods for field banks (describe the recommended monitoring methods to test the quality/viability of plant materials for the described storage method for this crop)	
Best practices:	Justification:

Survival rates Vigour Pests and diseases Replacement by other weeds	
3.3.2 – Monitoring frequency on field banks <i>(describe the recommended frequency monitoring should be done in each type of storage for this crop)</i>	
Best practices	Justification:
3.3.3 - Recording information during storage monitoring on field banks <i>(describe the type of information that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content
Step 4 – Conservation on field banks - <i>If you have already provided this information to the regeneration guidelines, please indicate where applicable and add any additional relevant information in the boxes below.</i>	
4.1 – Sample specifications on field banks	
4.1.1 – Sample preparation <i>(describe the methodology to prepare the samples for storage/planting; propagation/germination techniques, pre-treatments, special care, procedures)</i>	
Best practices:	Justification:
Pre-treatments	
Propagation/germination techniques	
Plant health requirements	
Special care	
4.1.2 - Sample (explant) type and size	
Best practices:	Justification:
Propagule type	
Propagule size	
Propagule development stage	
Minimum/maximum numbers of replicates/ accession to plant	
Others	
4.2 – Storage specifications on field banks	

4.2.1 – Field preparation	
Best practices:	Justification:
Field selection	
Planting season	
Soil/substrate preparation	
Isolation	
Randomization	
Replication	
Special requirements	
4.2.2 – Field planting	
Best practices:	Justification:
Spacing	
Design and layout	
Method	
4.2.3 – Field maintenance and management	
Best practices:	Justification:
Weeding method	
Weeding frequency	
Irrigation	
Fertilizer application	
Pruning/coppicing	
4.2.4 – Harvest for renewal	
Best practices:	Justification:
Method	
Frequency	
Health testing	
4.2.5 – Post harvest handling <i>(For those species where renewal of field genebank is required on a regular basis e.g cassava)</i>	
Best practices:	Justification:
4.2.6 - System for tracking materials/inventory system in field banks <i>(describe the best recommended methods as well as alternatives in case of limited conditions)</i>	
Best practices:	Justification:
4.2.7 - Recording information during storage/planting in field banks <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during storage)</i>	
Data field name	Content

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Common steps (regardless of conservation strategy)	
Step 1 – Registration: <i>Describe the registration procedures for this crop. Add additional steps if required.</i>	
1.1 – Verification accompanying documentation <i>(list required documents and information including quarantine regulations)</i>	
Best practices: Import permit Phytosanitary document Passport data Characterisation data (If available)	Justification: Avoid new disease introduction, Trace germplasm origin
1.2 – Verification of consignment <i>(physical/ visual inspections required before accession numbers are assigned)</i>	
Best practices: Not performed	Justification:
1.3 – Recording information <i>(actual registration, labeling and methods to enter the information)</i>	
Data field name	Content
Serial.	
Nomenclature: T (for tropical) followed by Genus and species initials (TZm+nb)	
Step 5 - Regeneration <i>(this information has been collected in a separate format and will be extracted from there)</i>	
Step 6 - Characterization <i>(describe the recommended procedures for this crop)</i>	
6.1 – Planting and cultural practices for characterization <i>(detail if differ from regeneration procedures)</i>	
IITA MAIZE is PRESENTLY CHARACTERISED – NO RECOMMENDATION FROM US YET	
Best practice:	Justification:
Environment	
Soil type	
Rainfall	
Season	
Plot size	
Sampling area/border area	
Plant density	
Replications	
Standard check cultivars	

Frequency of standard checks	
Time of day for data collection	
6.2 - Morphological descriptors for characterization <i>(website links will be inserted here to Bioversity descriptors). Detail any additional descriptors not included in the Bioversity descriptors for this crop. If there are no Bioversity descriptors attach a list of descriptors used/recommended</i>	
Descriptor	Definition
6.3 - Pictures for characterization <i>(describe relevant plant parts to record)</i>	
Best practice:	Justification:
6.4 - Herbarium samples for characterization <i>(describe best procedures for your crop)</i>	
Best practice:	Justification:
6.5 - Molecular descriptors for characterization <i>(describe best procedures for your crop, if applicable)</i>	
Best practice:	Justification:
6.6 - Cytological characterization <i>(describe best procedures for your crop, if applicable)</i>	
Best practice:	Justification:
6.7 – Nutritional traits for characterization <i>(describe best procedures for your crop)</i>	
Best practice:	Justification:
6.8 – Others	
Best practice:	Justification:
6.9 - Recording information during characterization <i>(list the data fields in addition to descriptors that should be recorded and the recommended methods to check possible errors or understand changes during storage). Select from the list below and add any missing ones)</i>	
Data field	Content

Step 7 – Distribution of plant materials	
7.1 – Policies and regulations for distribution	
7.1.1 - Common policies on distribution and access to plant materials <i>(describe policies that are common for most institutions holding this crop)</i>	
Best practice: SMTA for maize germplasm	Justification: Maize is an annexe 1 crop and IITA is part of the ITPGRFA (distribution follow multilateral system)
7.1.2 - Policy exceptions <i>(describe exceptions for relevant institutions holding this crop)</i>	
Best practice: none	Justification:
7.1.3 - National laws and regulations <i>(list relevant permits and certificates required in common for most countries holding this crop)</i>	
Best practice:	Justification:
7.1.4 - International laws and regulations <i>(list relevant international permits and certificates required for most countries holding this crop)</i>	
Best practice:	Justification:
7.1.5 - Phytosanitary regulations <i>(list the important regulations for your crop or refer to health testing section)</i>	
Best practice:	Justification:
7.2 – Users related issues for distribution	
7.2.1 - Feedback to users <i>(give estimates of the time frame and other factors that can influence the delivery of plant materials of your crop)</i>	
Best practice: When active seed stock allows distribution, request processing takes between 3 and 5 weeks. When active seed stock do not allow direct distribution, request processing	Justification:

takes between 6 and 10 months.	
7.2.2 - Customer assurance (<i>recommend procedures that ensure the materials distributed match the client request</i>)	
Best practice: Passport and characterization data provided to the customer	Justification:
7.2.3 - Feedback from users (<i>list most relevant information required to be received from users</i>)	
Best practice: Not applicable yet	Justification:
7.2.4 - Quantity of material recommended to be distributed	
Best practice: 100 seeds	Justification:
7.3 - Procedures for distribution (<i>describe the recommended procedures and requirements for each heading; update or add any additional steps</i>)	
7.3.1 - Check availability	
Best practice:	Justification:
Checking seed	Yes
Availability in stock	More than 500 seeds in the bank
Checking passport data	Only accessions with passport data are distributed
7.3.2 - Preparing samples for distribution	
Best practice:	Justification:
Check if accession maintained in our bank	
Check seed availability	Distribute sample which seed stock in the bank is higher than 500 seeds (all samples)
Check germplasm list after sorting	Only send requested sample
Check customer requirement (seed treatment or not)	
7.3.3 - Preparing the information list to accompany the plant materials	
Best practice:	Justification:
All Passport data All characterization data	
First cover letter: send before seed sorting to check if customer agree with transfer agreement prior starting to work on a request.	

Second covering letter: Sent when germplasm is ready for dispatch	
7.3.4 - Type of information <i>(list additional minimum information required to be sent to customers, in addition to the <u>Multi-crop Passport Data</u>, often agreed as best practice)</i>	
Best practices: FAST shipment number included in cover letter	Justification: Allow customer to follow up on his request
7.3.5 - Dispatching the plant materials	
Best practice:	Justification:
Each accession pack in paper envelop or small plastic bag	Avoid mixing seeds
Overall request packed in envelop or box depending on number of accessions distributed	
7.3.6 - Recording information during distribution <i>(list the data fields that should be recorded and the recommended methods to check possible errors or understand changes during distribution). Select from the list below and add any missing ones)</i>	
Best practice:	Justification:
Reference number	
Crop name	
Consignee's name and designation	
Name and address of organization	
Shipment number	
User information <i>(type of organization requesting materials)</i>	
Date of request	
Date of supply	
Number and quantity of samples provided	
Phyto-sanitary certificate	
Export permit number	
Request purpose	
Remarks	
Seed lot location in the store	
7.3.7 - System for tracking materials/inventory system for distribution <i>(describe the best recommended methods as well as alternatives in case of limited conditions)</i>	
Best practices:	Justification:

