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Genebanks

Genebanks QMS

Charlotte Lusty, December 2023

Genebanks operations



Long-term
storage



Safety
duplication



Regeneration &
characterization



Information
management



Disease
testing



Distribution

Acquisition
Characterization
Cryopreservation
Distribution
Germination testing
Germplasm health testing
Information and data management
InVitro subculture
Live Plants
Long-term storage
Medium-term storage
Regeneration /Multiplication
Seed processing

Relevant standards



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International Standards
for Phytosanitary
Measures (ISPMs)

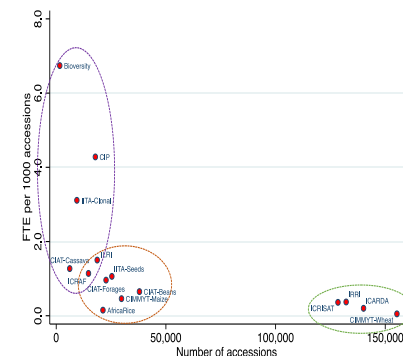
Diverse crops & collections



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Crop type	Category	Crops
1	Self-pollinated cultivated cereal	Wheat, barley, rice, small millets
2	Self-pollinated food legume	Beans, cowpea (& other leguminous spp at IITA), chickpea, lentil, pea
3	Self-pollinated wild cereal	Wild relatives of crop type 1
4	Cross-pollinated cultivated cereal	Maize, sorghum, pearl millet
5	Cross-pollinated wild cereal	Wild relatives of crop type 2
6	Cross-pollinated food legume	Grasspea, faba bean, pigeon pea
7	Cross-pollinated forages, species that are difficult to manage	Forages, trees, wild potato & sweet potato held as seed at CIP, groundnut
8	Clonal	Banana, cassava, potato, sweetpotato, yam, Andean roots and tubers

Collection size



Performance management system



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Backlogs in CGIAR genebanks in 2012

All genebanks (except IRRI) had backlogs

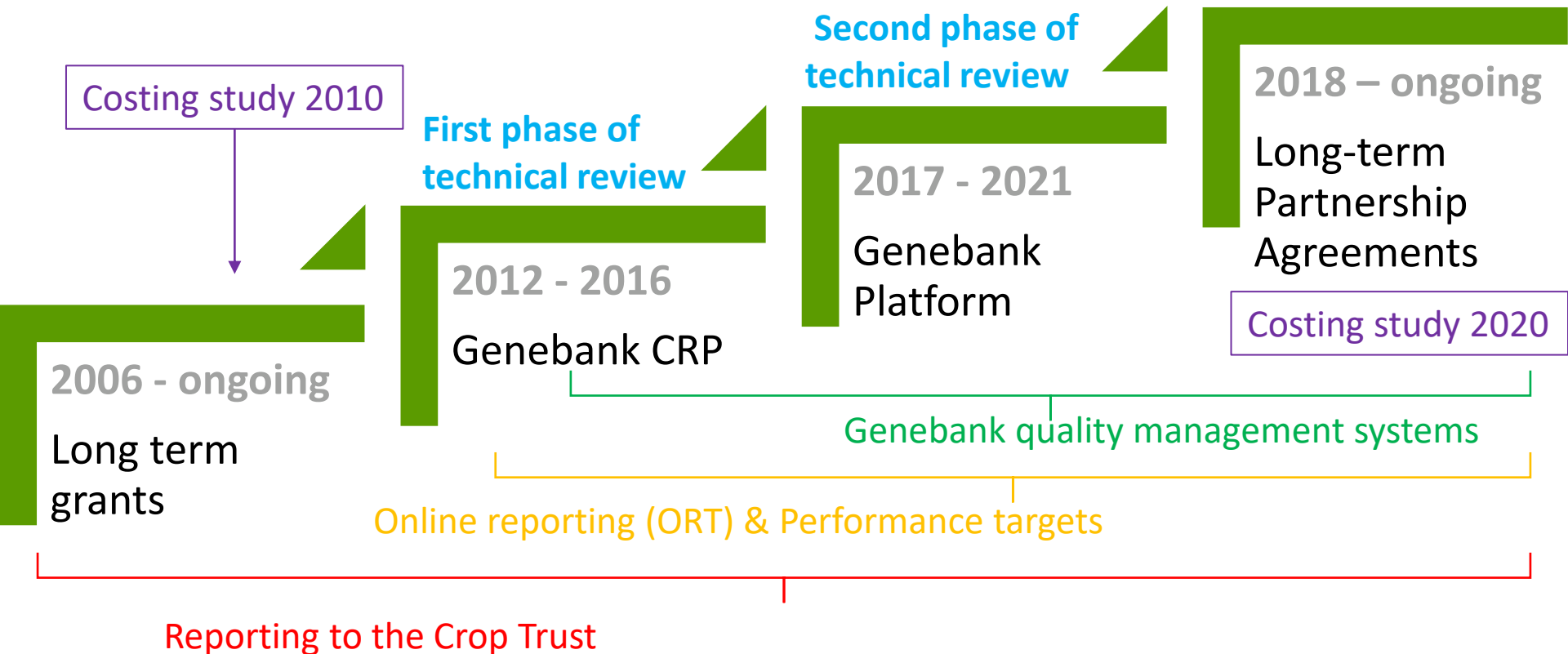
- Of total 708,761 accessions

- 34% not physically available without regeneration or cleaning
- 45% not safety duplicated in two locations

Genebanks CRP response

- Performance targets
- Online reporting
- Quality management system
- SOP documentation audit
- External review and validation.

Genebank performance management



Online reporting



- Main menu**
- [View Profile](#)
- [Logout \(celusty\)](#)
- Performance indicators**
- [Financials](#)
- [Recommendations](#)
- [Quality management](#)
- [Data triangulation](#)
- Other functions**
- [Calendar of events](#)
- [Document repository](#)
- [Submission schedule](#)
- [Center annual report](#)
- [Grantee dump](#)
- [News](#)
- [Reporting](#)
- [Download User Manual](#)

IRRI	Performance indicators	2016	Annual report	Rice
Save as Excel			Attachments	History
ARS.02 TABLE AS4 - Seed collection accession numbers				

Total number of accessions	Live plants	LTS	MTS	Total number accessions counting individual accessions only once	Summed total
In the costed collection	3	122,538	127,678	127,917	250,219
Legally available within the costed collection	3	117,640	122,782	123,019	240,425
Genetic stocks within the costed collection	0	3,546	8,916	8,916	12,462
With health status tested	0	104,473	109,148	109,185	213,621
Health tested in 2016	0	2,851	8,065	8,065	10,916
With health status clean	0	104,389	109,054	109,093	213,443
Disease cleaned in 2016	0	4	1,376	1,376	1,380
With known viability		120,330	125,509	126,575	245,839
Tested for viability in 2016		5,031	18,785	21,570	23,816
With acceptable viability		115,350	120,459	124,923	235,809
Regenerated (because of low viability) in 2016		437	2,509	2,537	2,946
With acceptable seed number		117,968	126,688	127,912	244,656
Subjected to seed increase in 2016		254	3,287	3,291	3,541
Legally and physically available	3	111,031	120,071	120,074	231,105

Comments

The proportion of accessions in LTS is decreasing because we no longer routinely put genetic stocks into LTS. Few LTS germination tests because we've fully implemented the new efficiency measure not to test samples in LTS if the equivalent sample in MTS has satisfactory germination. Few MTS germination tests because (1) we are at the low point in the post-GPG1 cycle and (2) as agreed we are not routinely monitoring genetic stocks. Because of the policy on genetic stocks, the number of samples with known viability and acceptable viability in MTS will become a decreasing % of total accessions stored in MTS.

Genebanks QMS (rather than ISO)



- Based on FAO genebank standards rather than generic standards
- Holistic: acquisition to distribution rather than selected procedures or processes
- Internally driven with collective and individual goals
- Efficient in terms of the amount of paperwork
- Allows integration of topical issues and emerging risks
- Easily tailored to the unique situation of each genebank
- Suitable for a network with templates and shareable elements across countries, crops and conservation systems

Genebanks QMS

Phased assessment of written SOPs for key processes:

- Conservation (viability testing, processing, storage)
- Regeneration & characterization
- Acquisition
- Distribution
- Safety duplication
- Information management

Same template, but individual genebank's SOP

Other QMS elements

- Restricted access
- Staff succession
- Barcoding
- Data management system
- Equipment calibration

Document SOPs



Audit for compliance
with standards



External validation

GOAL workshops & QMS intensives



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Benefits of Genebank QMS

- More meaningful technical reviews and useful recommendations
- Strengthened staff succession and emphasis on *long-termism*
- Staff empowerment, clarity of responsibility and motivation
- Opportunities for capacity building and alignment between institutes
- Effective prioritization and pipeline for research & optimization
- Basis for costing and cost savings (USD 3 million/yr)
- Strengthened collective thinking
- 350+ drafted SOPs

QMS
strongly
endorsed in
2017 IEA &
2023 IAES
reviews

QMS Harmonization

Persisting issues:

- Switching comprehensively to one data management system
- Parity in costs and standards (esp phytosanitary)
- Evolving beyond mandate crops to a more regionalized approach
- Continuous workflow efficiency
- Expensive crops (e.g. forages, clonal crops)
- How to sustain auditing & updating on top of System, Centre and Crop Trust-commissioned evaluations

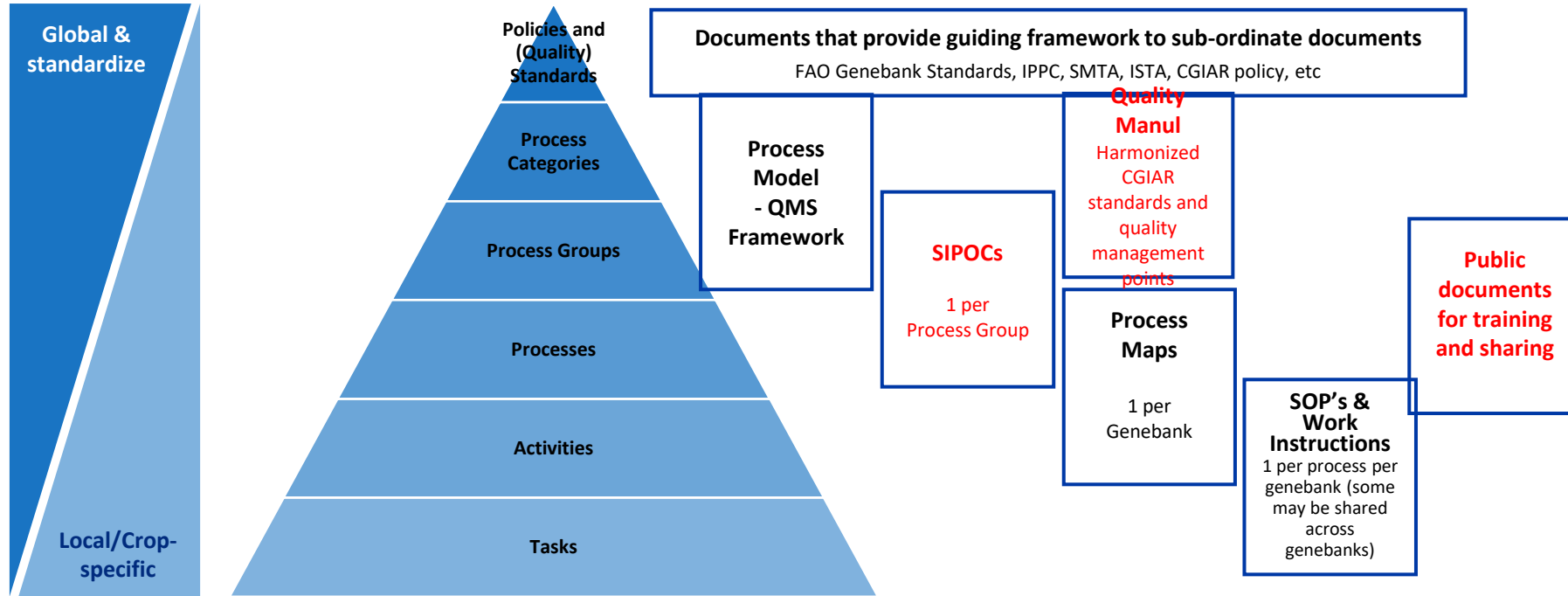




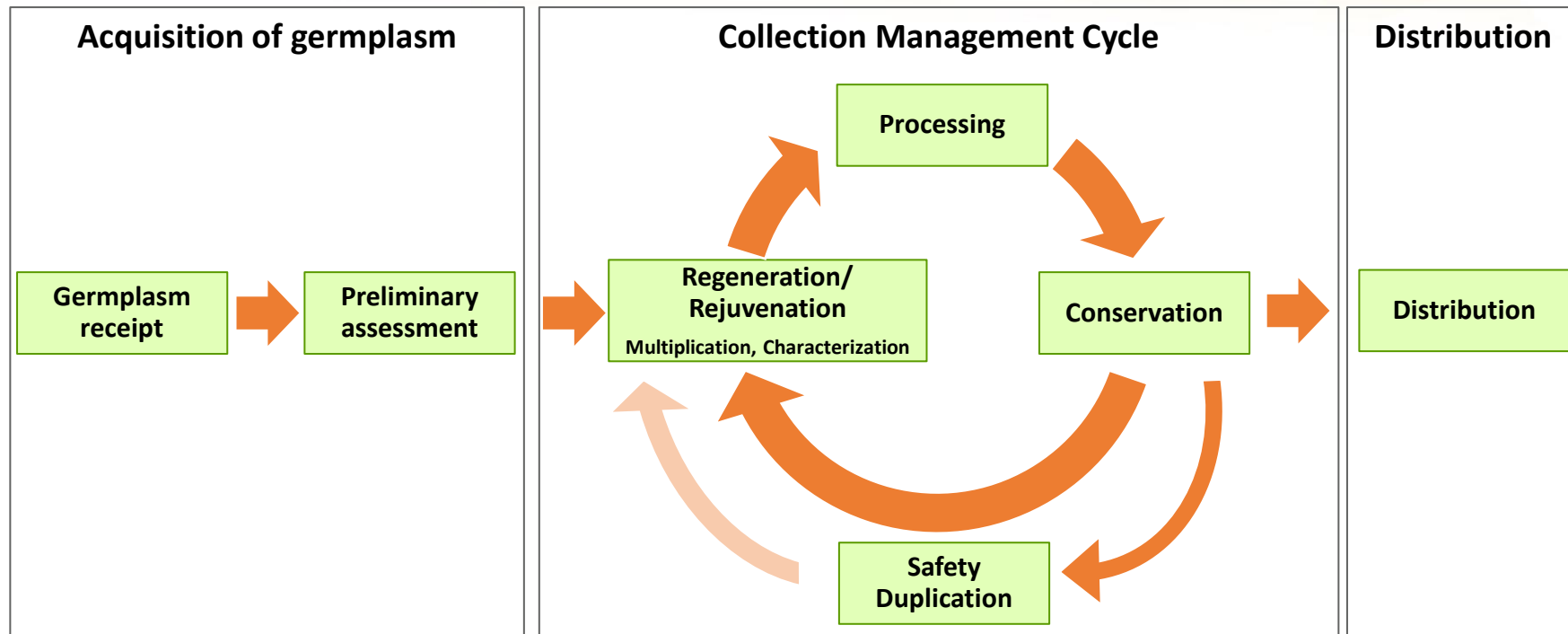
Structure and documentation of the CGIAR Genebank Process Model (BPM)



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Genebank's Process Model




Overall Process Map for Genebanks Process

Process Groups	Acquisition of Germplasm			Collection Management Cycle							Germplasm Distribution		
Process	0	0 to 1	1	1 to 2	2	2 to 3	3	3 to 4	4	4 to 5	5	4 to 6	6
Process Name	Germplasm Receipt	A	Preliminary Assessment	B	Regeneration/ Rejuvenation <i>Multiplication Characterization</i>	C	Processing	D	Conservation	E	Safety Duplication	F	Distribution
Activities	<ul style="list-style-type: none"> Deposit request (User interaction) Legal Review Shipment Health check If <u>needed</u>: Initial multiplication under quarantine conditions 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Uniqueness Viability check Quantity Health status Taxonomy check 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Site selection Planting Data collection for key descriptors Germplasm harvest & post harvest 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Preparation for storage (including cleaning, viability test, drying, counting and packing, plantlet preparation) 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Storage type & Location selection Viability/ Vigor monitoring during storage Quantity monitoring Subculturing 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Select Safety duplicate site Deposit Contract with recipient 	<ul style="list-style-type: none"> Evaluation Decision 	<ul style="list-style-type: none"> Distribution Request (User interaction) Legal review
GHU- and other Service Processes	<ul style="list-style-type: none"> Shipment processing Quarantine handling Treatment 		<ul style="list-style-type: none"> Phenotyping Genotyping 		<ul style="list-style-type: none"> Health monitoring Field inspection 		<ul style="list-style-type: none"> Health monitoring & cleaning 		<ul style="list-style-type: none"> Depending on need 		<ul style="list-style-type: none"> Depending on need 		<ul style="list-style-type: none"> Health monitoring Viability/ Vigor monitoring Health statement
Decision(s) at Gateways		Decision to invest into "preliminary assessment"		Decisions (1) to assign Accession # (2) Need for Regeneration/ Rejuvenation		Processing readiness		Conservation readiness		Decisions whether (1) Back up is needed- go to Safety Duplication (2) Material is ready for Distribution- go to Distribution		Distribution Request Approval	

Same process, different purpose

- Selection of Accessions
- Sub sampling & packing
- Shipping

 Periodic Replacement?
 Yes-go to Regeneration/ Rejuvenation

Genebank harmonization – Dec 2023



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- Processes are different for good reasons
- Chose carefully areas for harmonization vs standardization (e.g. user management, germplasm distribution, phytosanitary health, critical decision & quality points).
- Move from CoPs into self-sustaining cross-Centre teams
- Basis for data management system

Thank you



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