Bioversity Genebank Review 2020

Programme: Genebank Platform	
Genebank reviewed: Bioversity	**Site visit Dates:** 2 – 6 March 2020
	Review report Date: 08 June 2020
	Center and Crop Trust responses: 30 June 2020
Place: Leuven, Belgium	
Genebank Manager	Nicolas Roux
Review Panel	Hugh Pritchard (Chairman)
	Steve Adkins
Crop Trust staff	Nelissa Jamora, Luigi Guarino

	Observation	Recommendation for clearance	Due date	Responses
1	1 major observation	**Standard Operating Procedures** - Improve and revise key SOPs so that they are all of a high standard	Dec 2020	Bioversity: We will improve and revise all SOPs to a high standard by Dec 2020. Crop Trust: Agrees with recommendation and response.
2	1 major observation, shared with point 3 on management	**Leadership** - Senior management of the Alliance need to clarify and simplify the management structure of the ITC so that responsibilities of staff are clear and one person takes overall responsibility for the strategic management of the genebank as a whole.	Dec 2020	Bioversity: We will prepare a document explaining the particularity of our partnership with KULeuven in order to clarify the management structure. Crop Trust: Agrees with the recommendation and appreciates the response. It is understood that the structure of the genebank is particular. Nevertheless, we agree with the reviewers that the overall management needs to be clear and critical decision-making needs to take place unimpeded. The current situation appears to be preventing that, so adjustments may be necessary.
3	1 major observation	**Management** – Senior management of ITC should resolve key outstanding operational management actions.	Mid-2021	Bioversity: Management decisions will be clarified once the Alliance structure is in place. Crop Trust: The reviewers have highlighted in their

				report a number of discrete outstanding actions that need to be addressed. We hope these can be addressed within the time proposed.
4	1 major observation	**Safety duplication in MTS -** A risk management plan should be written and all accessions in the collection should be secured in safety duplication off-site.	Mid-2021	Bioversity: We will carry out a cost study on different options for backing up the in vitro accessions that are not cryopreserved (30% of the collection). Crop Trust: Agrees strongly with the recommendation and appreciates Bioversity's response. We hope that measures are put in place next year to ensure that the 30% of the collection that currently is not backed up is covered in one way or another. Perhaps national partners or IITA may be able to help in this respect?
5	1 major observation	**Phytosanitary cleaning -** All *in vitro* accessions should be cleaned and made disease-free by the end of 2020 (so that they can be cryobanked in 2021).	Dec 2020	Bioversity: This work is ongoing, but it will not be possible to meet the deadline of Dec 2020. A concept note was sent recently to the MT of Genebank Platform to explain how this can be done before end of 2022 with additional funding. Crop Trust: Agrees with the recommendation. The proposal provided by Bioversity is being addressed by the GHU group. We hope that this will result in speedy action on this recommendation.
6	1 minor observation	**Virus indexing -** A contingency plan for virus-testing should be drawn up to address potential problems with the current virus-testing	Dec 2020	Bioversity: We will prepare a workplan to resolve the issues and accelerate the completion of virus indexing.

		service, such as lack of throughput continuity or changes in value for money.		Crop Trust: Agrees with recommendation and appreciates the response.
7	1 major observation	**Cryo collection** – A comprehensive cryo facility disaster response plan should be prepared and made known to all staff.	Dec 2020	Bioversity: We will prepare a document (business continuity plan) to address the response to different types of disasters, e.g. pandemic, explosion, etc. Crop Trust: Agrees with recommendation and appreciates Bioversity's response.
8	2 major observations	**Cryo collection** - Cryo operations and workflows should be fully digitized and integrated into the genebank data management system and accessions barcoded.	Dec 2020	Bioversity: Operations and workflows will be fully digitized and integrated into MGBMS. The barcoding would involve not the cryo accessions themselves in LN, but the preceding activities. Crop Trust: Agrees with recommendation and appreciates Bioversity's response.
9	1 minor observation	**Identity verification -** ITC need to encourage and facilitate USDA adoption of MusaTab to enable digital data collection and exchange for accessions undergoing testing for trueness-to-type.	Dec 2021	Bioversity: We will encourage USDA to use MusaTab for the Field Verification activity. Crop Trust: Agrees.
10	1 minor observation	**Identity verification -** ITC should develop and implement a workplan to accelerate the process of identity verification and remove the backlog as quickly as possible.	Dec 2020	Bioversity: We will document a workplan to reduce the backlog more quickly than is currently happening. Crop Trust: Agrees.
11	1 major observation	**Information technology -** ITC needs to complete the backlog of work raised with the RP.	Dec 2020	Bioversity: We will prepare a workplan to remove backlog of IT issues. Crop Trust: Agrees with the recommendation and looks forward to hearing the

				progress by the end of the year.
12	1 minor observation	**Information technology -** Sharing of partners' MGIS characterization data with Genesys should be completed.	Dec 2021	Bioversity: Once the data are cleaned, they will be uploaded to Genesys. Crop Trust: Agrees with the recommendation and is delighted to hear that MGIS data will be available in Genesys.

Background

Bioversity has the mandate to conserve the widest possible diversity of *Musa* germplasm and to make it available for use. The International Transit Centre (ITC) holds the world's largest collection of banana and plantain. These genetic resources are maintained under an agreement with the Governing Body of FAO's International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

The collection consists of 1617 accessions (as of December 2019) with representatives of most groups and species that occur in the genus *Musa*. The collection is made up largely of cultivated banana accessions (75%) belonging to 17 genomic groups and 52 subgroups, crop wild relatives (15%) from 34 species, and a range of improved materials (10%) obtained from banana breeding programmes around the world. The collection also holds a small number of accessions belonging to the related genus *Ensete*.

Before the visit, the Review Panel (RP) met twice via e-conferencing on 7 and 19 February 2020 to agree on the schedule for the visit and to determine who would take the lead in covering which of six key Standard Operating Procedures (SOPs): Acquisition; Regeneration and Characterisation; *In Vitro* Conservation; Cryobanking; Distribution and Exchange; and Safety Duplication. Other documents reviewed included: 2013 Review; Self-Assessment; Annual Reports and Data Validation; Quality Management System Audit Report; User Surveys; and Genebank Impact Papers.

During the visit, the RP, accompanied by Luigi Guarino and Nelissa Jamora (Crop Trust), met the following key staff from Bioversity Leuven, Montpellier and Rome: Nicolas Roux, Ines van den Houwe, Bart Panis, Swa Hendrix, Max Ruas, Rachel Chase, Els Kempenaers, and, at the start and end of the visit, Stephan Weise (via teleconferencing).

Following a general introduction and discussion of the last Review and the Self-Assessment, the RP thoroughly reviewed the SOPs (c. 200 pp), including the validation of processes, equipment use, glasshouse use, phenotyping, virus cleaning systems, paper records and databases, barcoding system, etc. Throughout this intensive process, the RP were provided with comprehensive information about all aspects of the day-to-day running of the ITC. The RP found that ITC is staffed by a group of highly professional and dedicated individuals who fully engaged with RP throughout the process. We thank them all for their input, cooperation, transparency and patience throughout the review.

RECOMMENDATIONS

Standard Operating Procedures - The SOPs reviewed were in widely different stages of preparedness, from good (i.e., with a clear structure, sub-headings, annexes / workflow; one SOP) to inadequate (i.e., uneven formatting, or actioned responses from a previous review not updated;

one SOP). Four SOPs were adequate but still need improvement. Whilst the Data Management SOP was unavailable, processes were discussed in considerable detail.
Recommendation 1: Improve and revise key SOPs so that they are all of a high standard.

Leadership. - Whilst the person responsible for decision making at particular steps in the SOPs is generally clear, the framework for the upper level decision making is less so. The RP feel that the lack of a single point of leadership across ITC's many functions will lead to longer-term problems, far beyond completing the SOPs to a high standard. From an organisational perspective, ITC is complex (and may become more so with amalgamation of Bioversity and CIAT within the Alliance) with functions spread across sites and the provision of specialist services by multiple institutes in different countries. Leadership is needed on the strategic direction of ITC, and to provide authority in inter-institutional negotiations on access to relevant in-house services and skills, joint problem solving, efficiencies, etc.
Recommendation 2: Senior management of the Alliance need to clarify and simplify the management structure of the ITC before the end of 2020, so that responsibilities of staff are clear and one person takes overall responsibility for the strategic management of the genebank as a whole.

Management - The day-to-day management of ITC is delivered by a group of highly professional and dedicated individuals with deep understanding of the science and technology and who clearly demonstrated a high level of cooperation. As in many organisations, the staff are constantly challenged by a changing working environment. At ITC, this relates to many operational issues, such as the need for a new maintenance contract for the cryotanks, succession planning in database management, and, more generally, new MoU arrangements with KULeuven (overheads, lab management needs), risk management of ITC and the development of a cryo disaster response plan. Having an organogram of roles and responsibilities for key scientific and management activities would help. But better overall planning is needed to attend to these foreseeable challenges.
Recommendation 3: Senior management of ITC should resolve these key outstanding operational management actions by mid-2021.

Safety duplication in medium-term storage - Excellent progress has been made to date, with about 70% of accessions in safety duplication through cryobanking (and the vast majority of the cryo samples further safety duplicated at IRD, Montpellier). Overall, safety duplication appears ahead of target. Nonetheless, the RP is deeply concerned that the remaining 30% of accessions in the medium-term storage (MTS) are not backed up at all. Moreover, neither the discussions nor the SOPs indicate the existence of a coordinated and detailed risk management plan.
Recommendation 4: A risk management plan should be written by the end of 2020 and all accessions in the collection should be secured in safety duplication off-site by mid-2021.

Phytosanitary cleaning and virus indexing - The *in vitro* lab, in which material is prepared for transfer into and from medium term storage, functions smoothly; and much progress with *in vitro* and cryo techniques has been possible through KUL student research projects. However, virus indexing and phytosanitary cleaning, currently carried out by Gembloux, remain problematic after many years of ITC operation. The RP feels that this area is the weakest link in the functioning of the ITC and is hindering the distribution of accessions and entry of material into cryo. Urgent and creative resolution is needed within existing resources, such as the rapid application of a few markers, a contingency plan for the use of another provider, and de-prioritising other activities whilst advancing this work.
Recommendation 5: All in vitro accessions should be cleaned and made disease-free by the end of 2020 (so that they can be cryobanked in 2021).
Recommendation 6: A contingency plan for virus-testing should be drawn up by the end of 2020 to address potential problems with the current virus-testing service, such as lack of throughput continuity or changes in value for money.

Cryo collection - The general management of the cryo operation is very good, as are the facilities, their maintenance and security. Whilst the connection between the paper record and location of samples in the bank was demonstrated, both the integration of cryo-bank records into the *Musa* Genebank Management System (MGBMS) and barcoding are needed. Also, there appears to be no clear cryo disaster response plan, which is needed as part of an overall risk mitigation plan for ITC.
Recommendation 7: A comprehensive cryo facility disaster response plan should be prepared and made known to all staff by the end of 2020.
Recommendation 8: Cryo operations should be fully digitized and integrated into the genebank data management system, and accessions barcoded, by the end of 2020.

Identity verification - About one third of the accessions grown in the field remain to be verified, mainly due to long response times of the voluntary members of the Taxonomic Advisory Group. The management of TAG workflow to date seems to be relatively passive and more active steps are needed to complete the verification process. Related to the whole process of field verification is the risk of data transcription errors, as records in the field are paper-based whilst ITC uses MusaTab.
Recommendation 9: ITC need to encourage and facilitate USDA adoption of MusaTab (by the end of 2021) to enable digital data collection and exchange for accessions undergoing testing for trueness-to-type.
Recommendation 10: ITC should develop and implement a workplan by the end of 2020 to accelerate the process of identity verification and remove the backlog as quickly as possible.

Information technology - Currently, between Leuven and Montpellier, 1.45 FTE are committed to database management and programme development. The vast majority of data management within the ITC operation appears to be functioning well, although the SOP was not available, and needs to be completed as soon as possible. Retrieving data from MGBMS that is needed by the Genebank Platform Online Reporting Tool (ORT) is possible, but is not straightforward. The sharing of accession characterisation data between partners is working well, but the procedure for inclusion of that data in Genesys is not clear and as a consequence no characterisation information is on Genesys. Enabling an upgrade of the cryo accession workflow to include barcodes, and overcoming inter-institutional or on-site differences in security levels associated with the introduction of new hardware / software are other problems that need IT input to resolve.
Recommendation 11: ITC needs to complete the backlog of work raised with the RP by the end of 2020.
Recommendation 12: Sharing of partners' MGIS characterization data with Genesys should be completed by December 2021.