IITA Genebank Review 2019

Genebank reviewed: IITA	**Site visit Dates:** 4 - 8 November 2019
	Review report Date: 27 January 2020
	Center and Crop Trust responses: 25 March 2020
Place: Ibadan, Nigeria	
Genebank Manager	Michael Abberton, Head Genetic Resources Center
Review Panel	Ehsan Dulloo
	Hugh Pritchard
	Jane Toll
Crop Trust staff	Charlotte Lusty and Nelissa Jamora

	Observation	Recommendations for clearance	Due date	Responses
1	11 Major observations	**Revise all SOPs and have them re-audited.** In revising the SOPs the following must be addressed: - procedures described step by step; - quality control decision points made clear; - staff position responsible for decisions and their deputies named; - policies and standards governing any processes, incorporated, annexed or referenced; - staff trained in the use of the SOPs; - version control and approvals process in place.	Complete revisions and staff training by end 2021.	IITA: Agreed. Crop Trust: An important recommendation which the Crop Trust agrees with.
2	1 Major & 1 minor observation	**Seed production and management processes** should be reviewed to ensure that the number of seed lots are reduced and/or minimized, seed number per lot increases and need for regeneration is minimized. The process should involve the rationalization of	Processes written and implemented by end of 2021	IITA: Agreed Crop Trust: Actions to address this recommendation should be done hand-in-hand with improving the data management of the collection. Improvements in the

		existing seed lots in medium term storage.		management of seeds lots and associated data should be evident in ORT submissions.
3	2 Major & 2 minor observations	**Develop an evacuation plan for the genebank collections**, taking account of priorities of different accessions, especially for the *in vitro* collection where genebank and breeders materials should be better distinguished and for the yam accessions that are only in the field (see Recommendation 10).	End of 2020	IITA: Agreed Crop Trust Agreed
4	2 Major & 1 minor observations	**Develop database scripts and tools** to allow genebank staff and management view and manipulate statistics on the status of the collection, including that of safety duplicates, and automate the generation of prioritized accessions lists (e.g. number of accessions with low seed number, priority accessions for viability testing, regeneration,etc)	End of 2020	IITA: Agreed Crop Trust: Hopefully full adoption of GRIN-Global CE will support actions to address this recommendation.
5	1 Major observation	**Percentage availability of the collection should be validated** through the provision of a list of accessions showing that thresholds for seed number, viability, health, legal status are met. The list should correspond with corrected data in the inventory database, GRIN-Global and Genesys.	List of accessions with required data provided to Crop Trust by end of 2020	IITA: Agreed Crop Trust: Looking forward to receiving the list.
6	2 Major and 4 minor observations	Attention is required to deal with multiple issues relating to **equipment and facilities maintenance and health and safety**, specifically: - Potential exposure of staff to fungicide in the viability testing room should be monitored and addressed; - Movement and holding of seed samples between processes should be in a sealable box with silica gel; - LN should not be stored in the cold room; - Movements of LN around within and between labs should be reviewed and minimized;	Report on improvements provided by end of 2020.	IITA: Agreed. Changes to viability testing room already made Crop Trust: Agreed. Good to hear changes already made.

		- More space is required in the cryostorage room to safely handle LN; - Oxygen monitors should be repositioned in the cryo storage room and outside the room; - Regular maintenance of flow hoods should be improved; - Manuals to use key equipment should be accessible where they are needed; - General maintenance records should be made available.		
7	3 Minor observations	**A sound process is urgently required to gain adequate confirmation that accessions are true-to-type and unique**. A precautionary interim solution, if necessary, could be put in place as soon as possible to prevent further delay to the implementation of cryopreservation.	Approach reviewed and implemented by end of 2020	IITA: Agreed. This is in process Crop Trust: Much sympathy in trying to tackle this difficult challenge but delaying cryopreservation (especially given the current COVID-19 crisis) is not an option.
8	1 Major observation	In view of the construction of the second floor of the GRC building we recommend that GRC take this opportunity to **reconsider the workflow of the operations throughout the ground floor** as well as improvements suggested in Recommendation 6. It is particularly recommended to strengthen the 'gradation in cleanliness' along the corridor towards the *in vitro* area to include the cryo preparation and storage process.	Plans for the reorganization of the genebank to be shared when possible.	IITA: Agreed. This will be a priority after the second floor is in place, funding permitting. Crop Trust: Agreed
9	1 Major observation	It is recommended that **priority is given to the optimization of the *in vitro* conservation protocol for yam** to enable the full incorporation of the yam collection into *in vitro.*	Protocol optimized by end of 2021	IITA: Agreed Crop Trust: Another seemingly intractable issue but which does need full attention if IITA is to perform its role in yam long-term conservation.
10	1 Major observation	**Priority should be given to the yam field collections** in terms of selection of land, upkeep, support from FMS and monitoring. The risk	Strategy for yam collection in place by end of 2020.	IITA: Agreed Crop Trust: Agreed

		management strategy should include specific measures to rescue unique accessions only found in the field (see also recommendation 3).		
11	1 Major and 1 minor observation	Urgent attention is needed to **ensure field monitoring data gathered on tablets is integrated into the inventory management system** so that the status of individual accessions may be monitored in both *in vitro* and the field.	Integration of field data achieved by end of 2020	IITA: Agreed Crop Trust: Agreed
12	2 Minor observations	**An acquisition policy should be elaborated** and, in discussion with breeders and IITA management, the criteria for the intake of breeders' materials and services provided by the genebank and their costs made clear.	Policy shared by end of 2021	IITA: Agreed Crop Trust: It will be good to have a clearer policy here even though it may need regular review.
13	1 Major & 1 minor observation	**Add functionality to the inventory management system** to enable data verification and correction. Rectify obvious errors such as those in mapping data fields between the different data management systems, e.g., on accession biological status and availability.	End of 2020.	IITA: Agreed Crop Trust: Agreed
14	1 Major & 1 minor observation	**Ensure passport and characterization data in GRIN-Global/IITA Website and Genesys is accurate and complete as possible**.	End of 2020.	IITA: Agreed Crop Trust: Agreed
15	1 Minor observation	**Recording of formal training should be improved and capacity of Deputies should be strengthened** to ensure that they can stand in for Unit Heads.	Training records available by end of 2020	IITA: Agreed Crop Trust: Agreed

Introduction

The technical review was carried out by three experts: Drs Hugh Pritchard, Jane Toll and Ehsan Dulloo. The Review panel undertook a document review followed by a week-long visit to the genebank. During the visit, the reviewers were supported by Charlotte Lusty, Genebank Program Coordinator, and Nelissa Jamora of the Crop Trust.

This current phase of review centres on the quality management system under development and, in particular, the standard operating procedures (SOPs) for the genebank operations. The Reviewers were provided with the IITA genebank's SOP documents, self-assessment, user surveys and response to the previous review in

2014, as well as Platform documents (online reporting tool (ORT) reports, etc.). They also viewed data on the collections at IITA, available to the public on the IITA website (GRIN-Global), Genesys and Svalbard Global Seed Vault (SGSV) portal.

The Reviewers, accompanied by Crop Trust staff, visited the IITA genebank in Ibadan from Monday 4 to Friday 8 November 2019. On arrival at IITA, they met with the Director General, Dr. Sanginga and the Head of the Genetic Resources Center, Dr. Michael Abberton. The DG stressed the importance of the genebank and the international collections it holds, to the whole of Africa. He emphasized the importance IITA accords to managing the collections to the highest standards. Dr. Abberton presented an overview of the work of IITA and the genebank, including current constraints and future plans.

Over four days, the Reviewers interviewed the teams responsible for the different areas of operation, inspected the facilities and audited the processes. They met with the technical staff at their workstations and held intense discussions with the Managers of the different teams:

- Seedbank – Oyatomi Olaniyi;
- *In vitro* Laboratory – Abigael Adeyemi and Deputy Genebank Manager, Gueye Badara;
- Field Genebank – Faloye Benjamin;
- Documentation - Marimagne Tchamba.

The Reviewers also visited the Germplasm Health Unit and virology laboratory. Dr Lava Kumar presented an overview of GHU-GRC processes to index and clean the collections.

The Review focussed on the globally important cowpea and yam collections, and to a lesser extent bambara groundnut, African yam bean and cassava.

Findings

The findings of the review of the genebank processes and SOPs are detailed in the attached Review Checklist. We made observations on each of the genebank processes and produced 15 recommendations (see above). The provisional findings were presented to the Director General and the genebank staff on the morning of the final day.

The overall standard of operation of the IITA genebank encountered by the Review Team was high. We were impressed by the very positive response to 2014 Review as evidenced by the upgrade to facilities (e.g., construction of new screen-houses and refitting of the plant tissue culture laboratory, installation of a liquid nitrogen production plant, advances in germplasm health and excellent GHU-GRC teamwork) and the obvious professionalism and enthusiasm of the staff to ensure these developments happened in a timely way. We thank Dr. Abberton, his senior management team and the whole GRC staff for their positivity, transparency, cooperation and patience throughout the Review. We found the GRC team to be a coherent and highly functional group. The following narrative focuses on selected major recommendations.

The SOPs are of variable quality and, in many instances do not reflect the procedures actually being applied in day-to-day operations. All the SOP documents need revision (see Recommendation 1). We recommend that they be re-worked to set out the processes in a step-by-step manner. They need to be clear as to what the

quality control decision points are, what the decision options are and which staff positions are responsible for the decision-making. We were shown SOP flow diagrams for germplasm distribution and recommend the use of such diagrams in all SOPs to help present the logic and functionality of the SOP. Policies and standards governing processes should be incorporated in the SOP, annexed or referenced. Photos or diagrams should be added when they help to inform an action or decision, but not just for illustration. We would suggest that the staff member responsible for a specific procedure or process unit, such as seed packing, viability testing, etc., write–up the specific process steps. Developing the SOPs in a "bottom-up" manner should ensure they reflect better the actual "day to day" operations, make them more informative for staff and of greater value for staff training. Overall, such training could be purposed and recorded better (see Recommendation 15).

We looked very closely at the way in which the documentation system worked for managing the collections. The system for barcoding and data up-load to tablets or directly to the inventory database at each workstation is robust but lacks the integration and functionalities for optimal collection management. Data recorded on tablets in the field, for example for the yam collection, needs to be fully accessible in the inventory database so that the field-bank manager can effectively monitor the vulnerable accessions, and this, in turn, needs to connect to the same accessions held *in vitro*. Data on the various seed lots of an accession need to be collated in one view for the seedbank manager to monitor viability, stock, disease status, and determine availability and plan regenerations effectively. We recommend the addition of Apps and other functionalities that will allow for easy overview and querying of the inventory database to facilitate management of the collections as well as data verification and correction. There are errors, gaps and inconsistencies in the data available to the public through the IITA website, Genesys and Svalbard Global Seed Vault (SGSV) portals. This impacts on the genebank's reputation and we recommend urgent attention to these issues. The errors in the GRIN-Global interface are the most critical, for example regarding accession availability. We suggest providing public access solely through Genesys until development of the GRIN-Global is complete (see Recommendations 4, 5, 11, 13, 14)

We were pleased to learn of the range of activities planned by the GRC to raise awareness of the ITTA genebank and promote the use of the collections, in particular in Africa. This should be supported by the elaboration of clear acquisitions policy (Recommendation 12). Having the GRC feature on the front page of the IITA website will undoubtedly help. However, availability of high-quality information and high-quality germplasm are the critical factors. Although the information system couldn't provide a clear picture of how much of the cowpea collection is now virus-free, we were confident that it was well in hand under the very active GRC-GHU collaborative and screen-house based process. It was also not possible to get a clear picture of the number of seed lots per accession and which of these meet the seed number and viability criteria for availability. Although there has been rationalization of the medium-term store, we advise further efforts in this regard once the inventory database has been upgraded with the necessary tools and functionalities to facilitate this. Availability of collections and cost-efficiency of their management are critical to securing long-term funding (see Recommendation 2).

The equipment and process upgrades since the 2014 Review have also had a positive impact on the management of the *in vitro* collections and implementation of cryo banking. The construction of a second floor to the GRC building for office space

will provide a wonderful opportunity to reconsider the workflow of the operations throughout the ground floor. For example, strengthening the 'gradation in cleanliness' along the corridor in the *in vitro* area. At the moment this does not apply to the cryopreservation operation, which is close to the washing-up room. Also the cryopreservation operation needs much more space. There are currently health and safety risks in moving around the room when carrying liquid nitrogen; and the plan to re-enter the area after evacuation in the event of oxygen depletion does not seem to be clear. A concern that applies equally to the seed, *in vitro* and field collections is the lack of a 'First Responders' plan in the event that the collections need to be evacuated. In addressing this, we advise a better separation in the physical location of the genebank 'in trust' collections from the breeders' collections conserved in the same locations. (see Recommendations 3, 6, 8)

The global significance of the yam collection is well appreciated by IITA management, as is its vulnerability. The Reviewers underscore the importance of ramping up efforts to ensure the security and integrity of the collection. This includes ensuring that it's allocated a suitable site for propagation, is safety duplicated at a geographically distinct site, monitored effectively as mentioned earlier and transferred as quickly as feasible, into *in vitro*. The *in vitro* conservation of yam is still a challenge and standard protocols need to be urgently refined to bring in more field accessions into *in vitro*. There is also an urgent need to accelerate the disease cleaning of the *in vitro* collection to facilitate its duplication and distribution. (see Recommendations 7, 9, 10).

The Reviewers congratulate the staff of the genebank on the excellent job they are doing and hope that the recommendations for improving the operations of the genebank will help them continue to achieve high standards. There is no doubt in our minds that the GRC plays a critical role in genetic resources conservation and contributes significantly to the reputation of IITA in Africa and worldwide.