ICARDA Genebank Review 2019

Genebank reviewed: ICARDA	**Site visit Dates:**	17 – 22 June 2019
	Review report Date:	19 July 2019
	Center and Crop Trust responses:	28 October 2019
Places: Rabat, Morocco and Terbol, Lebanon		
Genebank Manager	Ahmed Amri	
Review Panel	Stephanie Green (remotely)	
	Marisé Borja	
Crop Trust staff	Charlotte Lusty	

	Observation	Recommendations for clearance	Due date	Responses
1	2 minor observations	Add detail to the SOPs, including procedures and thresholds for specific crops in Lebanon and Morocco, task owners and the accountable person for specified decisions, quality control and for training of new and existing staff, plus detailed manuals in annexes. Also carefully distinguish between what is carried out on an exceptional basis because of present circumstances and what is optimal procedure.	Deadline for improved SOPs by the end of 2019.	ICARDA: We propose end 2020 to include SOPs for collecting and acquiring and documentation Crop Trust: Recommendation is important and need for more time is understandable.
2	2 minor observations	Develop the workflows in the genebank database so that accessions requiring vernalization, late sowing or other regeneration requirements are automatically flagged and accessions that are a priority for viability testing, health testing and regeneration are selectable automatically.	Deadline for workflows in the database by end of 2020	ICARDA: Agree Crop Trust: Recommendation is supported.
3	1 major observation	Develop a detailed scope of each crop collection and define	Scope and criteria for	ICARDA: Agree, for species not mandated to ICARDA, the

		criteria for archiving with advice from the crop communities. All non-mandate crops should be transferred to the appropriate CG genebank: i.e. Maize to CIMMYT or IITA, cowpea to IITA and sorghum to ICRISAT. Barley currently held at CIMMYT should return to ICARDA.	archiving developed by December 2019	accessions will be sent to respective CGIAR genebanks and for the others, the plan for the dynamic management will be in place by end of 2019 Crop Trust: Fantastic!
4	1 minor observation	Exert pressure at the highest level to ensure that the Lebanon genebank has access to a reliable, continuous supply of electricity.	September 2019	ICARDA: Agree, so far we do have three generators serving genebank under electricity cuts. However, we are in continuous contact with LARI to seek their help in ensuring connection with the company electricity supply. Crop Trust: Understands that negotiation is required but hopes that ICARDA management can achieve results here before the end of 2021.
5	2 minor observations	Connect alarms for the cold rooms in Morocco to the mobiles of appropriate staff without delay. Make sure alarm events are sufficiently recorded (even if frequent). Develop a plan for emergency responses specific to the genebank. Keep a maintenance schedule and records for equipment calibration.	September 2019	ICARDA: Alarms and connections to Mobile done in July 2019. The plans for emergency responses as well as for maintenance contract are being developed and will be documented. Crop Trust: Good to hear that an immediate response has been made and looks forward to an updated report on the Emergency Response plans for each site.
6	1 minor & 2 major observations	All efforts are required to move to a situation where 100% of accessions are tested for initial viability and all accessions that were not tested for initial viability should be tested as soon as feasibly possible given the current capacity and workplan. Viability testing should not be random during this period of extraordinary regeneration but targeted to species most at risk. Any additional testing should be of	July 2019	ICARDA: The recommended testing using one replicate is implemented inJuly 2019. However, there is still a backlog due to large number of accessions to be tested. Crop Trust: Great that action has already taken place. It is understood that time will be required to complete viability testing to a satisfactory degree and we look forward to reports on progress.

		accessions not already tested. To increase the coverage of accessions tested, one replicate rather than two should be tested as a temporary measure.		
7	1 minor observation and 1 major observation	From 2019, report only accessions that are safety duplicated with signed agreements at both first and second levels. Report data from Morocco and Lebanon only from 2019 onwards if the collection in Syria remains inaccessible.	End of 2019	ICARDA: Agree, will be implemented for 2019 report. But this should not affect the allocation of funding from the endowment Crop Trust: ICARDA's budget until 2021 is secure. We look forward to receiving the revised reports for the 2019 cycle.
8	1 major observation	ICARDA should receive adequate support at all levels to ensure that they are able to complete the process of regeneration and safety duplication, given that they are in a vulnerable position at present of regenerating in some cases their only safety duplicates.	Ongoing until the completion of the reconstructio n of the active collection.	ICARDA: Fully agree Crop Trust: Very much supportive of this recommendation.
9	2 minor observations and 4 major observations	Consolidate all existing data carefully. Whatever has not already been uploaded in the current database should be added and all data entries checked for completion. Develop and implement a plan to resolve data management issues, ensuring that the required functionality is in place in one chosen data management system, and that processes are established whereby curators are able to directly check and correct data in the live database and quality controls are in place to prevent the possibility of entering incomplete or inappropriate data.	End of 2019	ICARDA: Agree and a plan is developed for further development of the database. Historical C&E is under processing to be uploaded or made accessible in the online documentation system. Crop Trust: This is critically important recommendation concerning an issue that has plagued ICARDA for some time. There needs to be very positive change evidence and decisions made by end of 2019.
10	1 minor observation	Formalize the training of new and existing staff. Document training time targets and competency validation.	End of 2019	ICARDA: Agree, Plan will be developed Crop Trust: Agree

11	1 major observation	Given the competencies of the staff, their responsibility and evident experience, it is recommended that the position of Genetic Resources Head is combined with the role of Genebank Manager (in one of the two locations, Lebanon and Morocco). Consideration should be taken to bolstering up operational staff potentially to address current bottlenecks in processes (e.g. viability testing).	ASAP	ICARDA: has decided to designate the new head of genetic resources among the genebank existing staff. Due to funding limitation, viability testing will continue to be done through consultancy contracts in both sites. Crop Trust: Supports the intention of the recommendation to ensure that the funding for essential operations is indeed directed at essential operations. ICARDA has the same understanding. However, from ICARDA's response there remains a funding shortfall for basic operations – which needs to be reviewed and addressed.

Introduction

Commissioned by the CGIAR Genebank Platform, the review was carried out by Dr Marisé Borja, Associate Professor at Universidad Complutense de Madrid with Dr Stephanie Greene, Supervisory Plant Physiologist, USDA, contributing remotely. The reviewers were supported by Charlotte Lusty, Genebank Program Coordinator, Crop Trust.

The review was technical and focused on the quality management system that is being put in place. It included a validation of the standard operating procedures (SOP) for key operations. The reviewers were provided with the SOPs, Platform documents (online reporting tool annual reports) and various other documents. A User Survey was also carried out by Crop Trust.

The main phase of the review was the visits to ICARDA's locations at Rabat, Morocco and Terbol, Lebanon, which took place between 17 and 22 June, 2019. On arrival at ICARDA, the reviewers were briefed on the institute's research structure by the ICARDA Director General, Dr Aly Abousabaa, and the Director of the Biodiversity and Crop Improvement Program Dr. Michael Baum, and were introduced to the genebank and its staff by Dr Ahmed Amri, Head of the Genetic Resources Section.

Over five days, the reviewers interviewed the teams responsible for genebank operations, inspected the facilities and processes, and met with the technical staff at their workstations. Intense discussions were held with Ahmed Amri, Zakaria Kehel, Thanos Tsivelikas, Amal Ibn El Hobyb, Adil Moulakat, Hafid Aberkane in Morocco, and with Mariana Yazkbek, Bashir Awar, Rama Jawad, Jostelle Beyrouthy and Ali Shehadeh in Lebanon.

The preparations, professionalism and transparency of the genebank staff were key to the success of this review. The reviewers gratefully acknowledge the cooperation and patience of the ICARDA genebank staff throughout the review, including making themselves available over the weekend to be briefed on the findings and recommendations.

Findings

The validation of the SOPs and the reviewers' assessments of processes needing improvement are detailed in the attached Review Checklist. There are 12 minor observations and 10 major observations, resulting in numerous suggested improvements and 11 recommendations for clearance. The overall findings were presented and discussed with ICARDA management and the genebank staff on the final day of the visit.

The situation of the ICARDA genebank is exceptional since the entire collection is being regenerated from seeds retrieved primarily from the Svalbard Global Seed Vault (SGSV) but some also from other host institutes. Having been relocated to two new sites, the genebank is establishing new processes with relatively newly recruited staff. Despite this extraordinary situation, the collections are being reconstituted at a steady pace with good quality standards. The status of almost every accession is known and reflected in the data management system. The quality of seed production is notable, reflected by 100% viability recorded for many accessions, and the skills and care taken in regenerating multiple species at the same time is exceptional. The size of the backlogs is well known and the last retrieval from Svalbard will occur in September 2019. A key finding is that only 2,343 unique accessions (not available from elsewhere including SGSV) of the entire collection remain in Aleppo waiting to be retrieved. Furthermore, 11,781 accessions are not in SGSV but are safety duplicated elsewhere, of which 6.813 are breeding materials and 6585 accessions were received in Lebanon from Turkey during the course of reviewers' visit. The prioritization of accessions for regeneration is

considered appropriate and reflecting well the needs with respect to use and conservation of diversity. Additionally, it is amazing that ICARDA, during this period of elevated operation, has continued to acquire new accessions to fill gaps in the collection. More than 15,000 accessions have been added to the collection in these past few years.

ICARDA's efforts should be commended. The expertise and dedication of the staff, evident both in Morocco and Lebanon, in caring for the collections under exceptionally challenging circumstances is an example of scientific excellence. It is worth highlighting particularly the employees who were involved in protecting the genebank in Aleppo despite significant danger, recovering as many seeds as was possible, as well as transferring their knowledge to the next generation of staff in Morocco and Lebanon.

There is a high overall standard of operation of the ICARDA genebank. However, there are many mostly small areas for improvement and suggestions for lowering general risks. The SOPs, even if unfinished and lacking some specific details and updates, such as the use of tablets, reflect the activities being carried out. A minor flaw is that SOP task owners and revisions are not sufficiently documented. Training is described in the SOPs and is clearly occurring; however, it is not sufficiently structured or recorded. Communication between staff and managers for coordination and day-to-day functioning is fluent. Succession plans are being implemented. What still needs to be put in place are deputies and substitutes for the key research assistant positions. The staff is somewhat top heavy with a need for more junior positions than senior ones.

Operations are divided between two locations, which could initially be a weakness, however it is well justified in terms of facilities and climatic conditions given the diversity of species being managed and regenerated. Furthermore, the two locations provide the possibility for safety duplicating accessions between the sites, an idea which is endorsed by the reviewers. Each location has a competent genebank manager (Mariana Yazbek and Athanasios Tsivelikas). Combining the Genetic Resources Head with the genebank manager position is strongly recommended together with increasing the number of junior positions where appropriate.

The Morocco location is very constrained in terms of space for storage and operations, but a new facility is currently being built and is expected to be operational by February 2020. The site in Lebanon suffers from frequent and regular electricity cuts every day. Although there are generators that kick in during a cut, the disruption is a hindrance and if a solution can be found to ensure that the genebank is prioritized for connection to a more reliable electricity source that avenue should be pursued.

The reviewers were only able to visit field sites in Lebanon. Nevertheless, the fields visited were well organized with suitable fertilizer and phytosanitary measures in place for safe regeneration, as reflected in the SOPs. However, the documentation of field management in the database is insufficient. Barcode-tracking and automation including the use of tablets in the field has recently been deployed. The use of these technologies is encouraged as a means to minimize errors at all levels.

Several major findings relate to the data management system. At least two systems are running in parallel: the old system used in Aleppo is running off-line and provides both historic and current data as well as specific functionalities that are appreciated by genebank staff, and a new online system, which lacks many query functionalities and is not sufficiently updated with all the data available. Curators should be granted access to curate and upload data in the online database and the functionalities of the off-line database should be transferred to the online tool,

which has good communication with Genesys. The documentation specialist is competent but still in training and requires more support to achieve this. In the past, the time from generating data to making it available was unacceptably long because of an inefficient uploading system into the online database. This needs to change.

The review endorses continuing efforts to introduce automation and undertake conservation research but emphasizes that the focus should be on finding practical solutions such as increasing the number of accessions that undergo viability testing by eliminating replicates until the steady state situation is reached. Phytosanitary measures are in place even if the procedures in Morocco and Lebanon are slightly different. They are gradually catching up with one another and reaching international standards. Overall phytosanitary procedures are adequate, including customized quarantine screening and seed treatment according to the requesting country. The use of FIGS to enhance targeted distribution is to be encouraged. Archiving accessions never requested and removing non-mandate crops are recommended to reach targets for relevant crops and crop wild relatives as soon as possible and to optimize resources.

Management of the wild species collection fully meets expectations with an exemplary approach to customizing protocols and ensuring facilities accommodate different types of seed production. ICARDA stands out in this regard and may offer support or capacity to other genebanks who are challenged with conserving wild species. For some accessions of cereal and food legume crops, seed characterization is done using a scanner, this methodology would be of interest for the entire collection. Such images as well as those taken in the field should be considered for uploading in the online database. The number of unidentified accessions is negligible.

A final note is made to request that full support is provided to ICARDA during this vulnerable period when the collection is being reconstituted from safety duplicated materials.

The reviewers congratulate the staff of the genebank on the excellent job they are doing and hope that these recommendations will help them continue to strive for high levels of operation and performance and the fulfilment of their objectives in rebuilding their genebank.