



*Evaluation of
CGIAR research support program for
Managing and Sustaining Crop Collections:
Genebanks CRP*

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Independent
Evaluation
Arrangement

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Abbreviations

A15G	Article 15 Group of Genebank Managers
AfricaRice	Africa Rice Center
AGM	Annual Genebank Managers meeting
Bioversity	Bioversity International
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
Crop Trust	Global Crop Diversity Trust
CRP	CGIAR Research Program
FAO	Food and Agriculture Organization of the United Nations
FIGS	Focused Identification of Germplasm Strategy
FTE	Full Time Equivalent
GOAL	Genebank Operations Advanced Learning
PGP	Global Public Goods
GRIN	Germplasm Resource Information Network
GRISP	Global Rice Research Partnership CRP
GRPC	Genetic Resources Policy Committee
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	World Agroforestry Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IEA	Independent Evaluation Arrangement of CGIAR
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IRRI	International Rice Research Institute
ISO	International Organization for Standardization
ISPC	Independent Science and Partnership Council of CGIAR
LTGs	Long-Term Grants
ORT	Online Reporting Tool
PGRFA	Plant genetic resources for food and agriculture
QMS	Quality Management System
RAP	Recommendation Action Plan
SGRP	System-wide Genetic Resources Program
SGSV	Svalbard Global Seed Vault
SINGER	System-wide Information Network for Genetic Resources
SMTAs	Standard Material Transfer Agreements
International Treaty	International Treaty on Plant Genetic Resources for Food and Agriculture
USDA	United States Department Of Agriculture
USDA-ARS	United States Department of Agriculture Agricultural Research Service

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Executive Summary

Background and context

The *ex situ* crop collections held in genebanks of 11 CGIAR Centers are among the largest and most diverse globally and are of major importance for agriculture and food security. Since 1994, through formal agreements between Centers and FAO, the collections have been held in trust under the auspices of FAO for benefit of the international community. The International Treaty on Plant Genetic Resources for Food and Agriculture (hereafter, the International Treaty), negotiated by the FAO Commission of Genetic Resources for Food and Agriculture (hereafter, the FAO Commission), came into force in 2004. It legislates for access of agriculturally important plant genetic resources under a Multilateral System of Access and Benefit Sharing. Article 15 of the International Treaty provides the legal framework under which the *ex situ* collections of plant genetic resources for food and agriculture are held by CGIAR Centers and other international institutions.

The CGIAR program for *Managing and Sustaining Crop Collections* is a research support program (hereafter, the Genebanks CRP). Genebanks CRP was approved for five years (2012-2016) for the management and the sustainable funding of the crop collections held in the genebanks of 11 CGIAR Centers. The CRP is a partnership between the CGIAR Consortium and the Global Crop Diversity Trust (hereafter, the Crop Trust). It represents a unique institutional arrangement for CGIAR because the "Program Manager", the Crop Trust, is a non-CGIAR entity, which together with the CGIAR Consortium has had responsibility for the dual governance of the CRP. The Crop Trust was selected due to its mandate to support the conservation and availability of crop diversity for food security worldwide through a "rational global system of crop genebanks". Considered an "essential part of the funding strategy" of the International Treaty, the Crop Trust is developing an endowment fund to support the conservation of important crop diversity in perpetuity, through institutions such as CGIAR Centers. The endowment would eventually resolve the issue of sustainable and secure funding for the genebanks. As the Crop Trust endowment has yet to be completed, the funding for CGIAR genebanks was to come from other sources, mainly Window 1, and therefore the CRP was created as a research support program that does not engage in research.

The Genebanks CRP's purpose is to conserve the diversity of plant genetic resources in CGIAR-held collections and to make this diversity available to breeders and researchers in a manner that meets high internationally agreed genebank standards, in a manner that is cost-efficient, secure, reliable and sustainable over the long-term, and is supportive of and consistent with the International Treaty.

Purpose, scope and objectives of the Evaluation

The primary purpose of this Evaluation is to support the improvement of the efficiency, effectiveness and sustainability of the management of CGIAR's genebanks for secure conservation and ultimately enhanced use of the collections of plant genetic resources for food and agriculture. The Evaluation provides an assessment of the Genebanks CRP's performance since its beginning, and provides lessons and recommendations to strengthen the operations and management of the new Genebank Platform.

The Evaluation scope was determined both by the specific mandate of the Genebanks CRP on one hand and the System-level needs with regard to *ex situ* genetic resources on the other hand. Therefore, the Evaluation also provides lessons on CGIAR System-level issues related to genetic resources conservation and use over and above what was included in the CRP, such as policy, reputation and representation of CGIAR and communication about its genebanks.

The Evaluation assessed the extent to which the Genebanks CRP has made progress towards achievement of its objectives, and has brought about positive changes in key areas of activity. It assessed the Genebanks CRP's governance and management, development and set-up, efficiency and effectiveness of implementation and funding. It also assessed the continued appropriateness and realism of the objectives as the Genebanks CRP transforms into Genebanks Platform. It explored the potential for increasing efficiency and effectiveness of central genebanks management operations in the future, and financial sustainability and realization of the endowment.

Approach and methodology

The Evaluation focused on four Key Questions and one Overarching Question:

- Key Question A, related to Efficiency and cost-effectiveness: Has the Genebanks CRP enhanced the management (and use) of CGIAR crop collections?
- Key Question B, related to Effectiveness: Has the Genebanks CRP enhanced the technical performance of Center genebank operations?
- Key Question C, related to Sustainability: How has the Genebanks CRP improved the security of CGIAR crop collections?
- Key Question D, related to Management and Governance: Has the Genebanks CRP been well managed and appropriately governed?
- Overarching Question: What has been the value added from the unique institutional arrangements of the Genebanks CRP?

The following are the most important sources of evidence that the Evaluation used for addressing the evaluation questions and as basis of its findings and conclusions that subsequently led to the recommendations.

- Review of governance and management records such as: CRP management meeting minutes; Crop Trust Board meeting summaries; Fund Council meeting records, Consortium Board summary record.
- CRP annual financial and technical reports and an Achievement Matrix provided by the Crop Trust at the Evaluation Team's request.
- 2015 Internal Audit Report for Genebanks CRP.
- Over 200 interviews with: the CRP Management Team; Staff at the Crop Trust; Center genebank managers and international and national staff; Center staff representing users and stakeholders of genebanks; external users in national genebanks and external experts; representatives of FAO Commission and the International Treaty; representative of Center and the Crop Trust governance; and staff at the Consortium Office and Fund Office.

- Surveys among Center senior management (through Directors General) and donors who contribute significantly to CGIAR, particularly through Window 1.
- Field visits to CIAT, CIMMYT, CIP, ICRAF and ILRI, and the 2016 Annual General Managers meeting in Australia.
- Factual data on genetic resources routine operations and flows to assess changes and variance in operations, for which the Online Reporting Tool (ORT) was an important source of information.

The Evaluation Team took into consideration the changes in the Genebanks Platform and the extent to which any issues of concern from this Evaluation appear to be addressed in the Platform.

Main findings and conclusions

Overall, the Evaluation concludes that the Center genebanks are now in a much better situation than before the Genebanks CRP, and much of the progress can be attributed to the Genebanks CRP. Resulting from the Genebanks CRP, there has been guaranteed funding, which has underpinned progress in synergy and harmony. Centers have developed long-term plans and, probably for the first time in the case of several genebanks, have been able to implement these plans without interruption, largely due to the stable funding for genebank operations over the past five years. The Genebanks CRP has promoted and encouraged such collaboration in a way that was more limited in the past. Center genebanks now routinely share common conservation approaches for the same (or similar) crops, exchange protocols, and even personnel on a short term basis, with Centers benefiting from each other's expertise.

A number of activities and initiatives have enhanced synergy and performance of individual genebanks, some of which are solely down to the existence of the Genebanks CRP. The most important activities initiated or promoted by the CRP include rolling out and implementing a Quality Management System (QMS), conduct of external financial and independent technical reviews for each Center genebank and funding critical actions deriving from review recommendations, work on data management systems, capacity development and coordination of collaboration and sharing of information and experiences. Genebanks are improving and on trajectories to meet the conservation and operational projections described in the Genebanks Platform proposal.

CRP governance

A dual governance arrangement was agreed for the Genebanks CRP, where the Crop Trust Executive Board had the primary role in the governance of the CRP, with oversight of management including financial accountability to the CGIAR Consortium Board (currently System Management Board) for the Genebanks CRP. Unlike with other CRPs, the Consortium was given an explicit role in the Genebanks CRP's governance and its management, which reflects the System-wide nature of the CRP and the System-level responsibilities of the Consortium.

The Evaluation concludes that the governance of the Genebanks CRP by the Crop Trust has largely been effective, which is evidenced by the level of reporting accountability from the genebanks to the

Crop Trust Executive Board, technical progress made across the genebanks, and overall satisfaction by the genebanks staff of the Crop Trust as manager of the program. However, there were some deficiencies in the Executive Board's oversight of the CRP. It did not receive specific CRP reports and updates, and items related to the Genebanks CRP did not seem to be clearly differentiated from other topics, such as scientific reporting, despite the Genebanks CRP being the largest compared to the Crop Trust's other projects. Regarding communication, there was lack of clear responsibility, strategy and resources, and this led to a situation where the accomplishments of the CRP were associated with the Crop Trust rather than with CGIAR and the Center genebanks.

The Consortium Board was expected to appoint a member to the Crop Trust Executive Board, but it was represented only at the first four meetings and then again in 2016. The Consortium Office was to facilitate the relationship between the Consortium Board and the Crop Trust by bringing matters to the attention to the Consortium Board and by following up on the Consortium Board's decisions. However, while the Consortium Board discussed the CRP regularly, it approached the Genebanks CRP as primarily a financial arrangement with the Crop Trust and focused, with few exceptions, on the approval of funding for the CRP.

The lack of follow-through and engagement in the CRP's governance and also management by the Consortium deprived the program of a "senior partner" able to complement the role of the Crop Trust in planning and decision-making. In addition, it affected interactions between the Crop Trust, Centers' leadership and the Consortium Board regarding System-wide issues at a more strategic level. For example, the closure, after the CGIAR reform, of two long-standing CGIAR entities (Genetic Resources Policy Committee and System-wide Genetic Resources Program) that had responsibilities on genetic resources policy and representation of CGIAR internationally, resulted in the lack of clear mechanisms within CGIAR to address policy matters. Also, there was decline in the visibility, representation and engagement of CGIAR on behalf of the System's genebanks. The loss of "voice" and representation in these areas created a vacuum and inability to provide a balance of interests within the Consortium-Crop Trust partnership.

The Evaluation also considered the Centers' oversight role. None of the governance and management arrangements for the Genebanks CRP relieves the Centers of their primary responsibility for the safety, sustainability and effective management of the individual genebanks in their care. The Evaluation found that issues related to the management and governance of the genebanks, and the Genebanks CRP, are usually handled at Center senior management level, and that Center Boards discuss genebanks only occasionally. However, the Quality Management System, that includes a risk management register, has actually enhanced risk management and oversight, which is one of the Boards' responsibilities. The Evaluation considers that there is scope for the Centers and their Boards to play a valuable role in CGIAR strategy, goals and priorities for genebanks.

The Evaluation assessed whether there is potential for a conflict of interest deriving from the governance and management of a CRP by an organization "outside" CGIAR that has its own mandate, goals and priorities related to conservation of genetic resources. Given that the endowment contribution to the Genebanks CRP over the past five years has never exceeded 20 percent, there is

limited risk of conflict of interest in the Crop Trust being both the CRP manager and donor. Indeed, in order to address the potential conflict of interest concerning genetic resources policy, where the Crop Trust has its own policy role, policy was not included in the Genebanks CRP, and in the Genebanks Platform policy is a separately coordinated module.

The Evaluation found that communication gave little visibility to the Genebanks CRP as a CGIAR program. This shortcoming, the Evaluation Team concluded, resulted from lack of attention on the part of the Crop Trust in particular, rather than due to any conflict of interest, but also lack of attention of the Consortium to the need for CGIAR to be visible in and off itself as the guardian of the crop collections.

CRP Management

The Genebanks CRP core management activities included technical, strategic and financial management; development and use of management tools; and interaction with the genebanks. The day-to-day management and technical support of the Genebanks CRP has largely been the responsibility of the CRP Coordinator and involves all together some 14 staff at the Crop Trust resulting in 7.1 full time equivalent for the Program in total (as per record of 2015). Considering that the CRP covers 11 Centers and the wide spread of activities, the Evaluation considered this appropriate.

There was general satisfaction with both financial and technical management of the CRP. The technical issues are complex, given the wide range of crops in the genebanks, and effective management has required developing a high level of crop understanding. This has led to constructively helpful interactions between the CRP Coordinator and individual genebanks. Both financial and technical management and accountability have involved reporting from genebanks to the Crop Trust through the online reporting tool, which is highly regarded. It was developed by the Crop Trust, which also provided guidance and feed-back. Financial management was described as well-organized and efficient with noted improvement over the years, and reporting from the Centers to the Crop Trust has been very detailed. This has led to better management and improved internal oversight of planning, costs, and spending across the genebanks.

The Genebank CRP management operates in consultation with the Management Team. Broadening the composition of the Management Team in 2013 to include representation of the genebank managers has strengthened the Team by engaging an essential stakeholder group in discussions that covered technical, resource, communications and financial areas. Meetings, however, focused mainly on updates and logistics, with little content on clearly strategic issues. Furthermore, the Management Team require its Terms of Reference clearly spelled out. The Consortium Office had a seat at the Management Team in order to serve its role in promoting system-level coordination and facilitating communication, providing feedback and participating in planning, but it participated very infrequently – only in half of the regularly held meetings.

An example of positive aspects of the CRP management was the external independent technical reviews organized to assess genebank operations and recommend measures to overcome any bottlenecks. The external reviews resulted in Recommendation Action Plans that were funded

according to individual genebank needs. Overall, these reviews have helped to consolidate and, in some cases, implement state of the art conservation, and should be continued periodically.

The Annual Genebank Managers meeting, convened by the Management Team, have been an important forum for all genebanks managers, CRP management and other Crop Trust staff, and they have involved also the Consortium Office. They were organized to review the past year's activities, progress and achievements, and to make plans for the next year. They have been extremely valuable for managing and coordinating technical developments in the CRP, and have been an important mechanism for enhancing synergy and harmonizing activities amongst the genebanks. They have facilitated an increased understanding of problems and issues experienced by individual genebanks, and involved engagement with national genebanks and international technical and scientific experts.

Fund allocation and financial stability

Funding was done on the basis of the 2011 Costing Study¹, commissioned by CGIAR and implemented by the Crop Trust. The Costing Study was done to provide, to the extent possible, accurate cost estimates for routine operations on conservation of the entire range of crops across CGIAR genebanks². The largest item for fund allocation (over 75 percent of annual funding) has been the standard, recurring genebank activities costs. Following the finalization of the Costing Study, and its use as a basis for allocation funds for genebank operations, areas which were insufficiently considered came to light, such as personnel promotions, capital investment needs, inflation, and volatility of foreign exchange markets. Furthermore, the requirement for full costing and Centers interpreting and applying full cost accounting inconsistently affected funding available for the genebank operations. Subsequently, a Parity Study was conducted in 2015 to address these problems, but these issues remain to be resolved. It is important that efforts continue to arrive at a better definition and analysis of recurring routine costs so that continued guaranteed donor support for the genebanks will not be at jeopardy.

Fund allocation to genebanks through the program has also included non-recurring items that were funded on basis of prioritization and items identified through the external reviews as critical following a bilateral negotiation between the Crop Trust and the specific Center genebank. The Genebanks CRP has funded some capital requirements, and activities intended to enhance cost-efficiency in basic conservation areas common to several or all genebanks, such as seed longevity.

While financial matters and updates were provided at the Management Team meetings, the Management Team did not have a clear role in decision concerning fund allocations. For transparency, the Evaluation Team considers it important that all future fund allocations would be made at the Management Team meetings and not bilaterally.

The Evaluation Team considers that the five-year time frame covered by the Genebanks CRP was unrealistic for raising the full endowment (USD 525 million) as initially anticipated by the Crop Trust. The full endowment for supporting CGIAR genebank operations is currently estimated to be even

¹ The Cost to the CGIAR Centers of Maintaining and Distributing Germplasm

² Costs for ICRAF's germplasm collections were estimated separately.

higher. The Evaluation Team considers that the transition period to full funding from the endowment will take longer than was originally forecast.

Reporting

Feedback from Centers was broadly favorable about reporting through the online reporting tool, particularly with regard to financial reporting and accountability. Technical reporting has been done according to annual work plans to monitor progress on targets for a set of indicators as per the genebank standards. The Crop Trust staff have been assiduous in assessing the reports from Centers and providing feedback as necessary. However, the amount of detail requested was sometimes considered excessive, partly due to the same high level of detail in information requested to be reported for each crop collection separately.

Regarding annual reports, the Team recognized they were a synthesis about what the genebanks had achieved compared to the level of detail submitted by the genebanks via the ORT. Given that the Genebanks CRP was a research support program and the template used by other CRPs did not suit this program, these issues were discussed with the Consortium Office in early 2013, with an initial understanding on how to address the specific needs of the program. This dialogue did not progress leading to a somewhat strained relationship between the Genebank CRP Management and the Consortium Office.

The Evaluation Team found that the annual reports did not easily facilitate the Team's need for information on the program achievements and progress over the years. This was partly because the template largely followed the format of other CRPs with sections on impact pathways and outcomes, and partly because there were changes in reporting on indicators over the years. The section on achievement which would have allowed elaborating on progress in genebanks and developments in the program, were found to have limited information. The Genebanks CRP reports contained as part of the CGIAR portfolio reports were informative, but by default were brief, focusing on program highlights. Thus the Evaluation Team was unable to determine what progress the CRP had made against the original program objectives that were spelled out in the approved CRP proposal. The Evaluation Team therefore requested a CRP Achievements Matrix for its perusal.

Representation of the Genebanks CRP and CGIAR in external fora and reporting to the FAO Commission and the International Treaty concerning genetic resources activities, which was not part of the CRP, was not consistent during the period the CRP was in operation. Rather, representation was piecemeal, and an opportunity was lost to demonstrate how CGIAR, as a System, was meeting its international obligations, and also to bring its collective experience and expertise to bear in these international fora. This seems to have followed from lack of agreement on how, and at which level or by whom, CGIAR should be represented particularly at FAO meetings.

Communications

The Genebanks CRP has not had a communications strategy for the program as a CGIAR CRP, nor social media presence. The Genebanks CRP management should have, from the outset, developed a

communications strategy for the CRP, independent of the Crop Trust, to raise the profile of CGIAR genebanks in recognition that most of the funding has come—and for some time will still come—from CGIAR. The lack of giving the CRP greater visibility as a CGIAR Program has not served the CRP nor CGIAR well. Joint communication by the Crop Trust and CGIAR could have been used for resource mobilization, highlighting how guaranteed funding through Window 1 and centralized management have enhanced the technical effectiveness and efficiency of the CGIAR genebanks, and to highlight the special relationship between CGIAR and the Crop Trust. The website being developed for the Genebanks Platform is long overdue.

Efficiency and effectiveness

The Genebanks CRP has led to improved efficiency of genebank operations by enhancing synergy and harmonization across the genebanks, particularly through the Quality Management System (QMS). The QMS has become an evidence-based, flexible framework to enhance standards across CGIAR genebanks, facilitate cross-genebank learning approaches, promote accountability and ownership of genebank operations at all staff levels, and help Centers to address non-financial resource aspects such as staffing and succession planning. Capacity has been built through Genebank Operations Advanced Learning workshops through which, to date, over 100 genebank personnel have received training in the QMS, bar-coding, the scope and obligations of the International Treaty, plant health, and several other topics. This capacity building has also been offered to staff from national genebanks, which is highly commendable. The QMS demonstrates distinct advantages of distilling the comprehensive FAO standards into a set of approaches and procedures that can be easily implemented by genebanks, and the manual being developed will be useful across genebanks worldwide.

The implementation of common approaches and improved collaborations among the genebanks has been successful to help save costs in individual genebanks, and progress has been made through the CRP to increase cost-effectiveness where possible. Cost savings across Centers have, however, not been as high as might have been expected because of the inherent differences among genebanks, and the conservation approaches for their collections. The Evaluation Team did not consider rationalization of collections by elimination of duplicate samples across seed collections worthwhile for cost saving, because of the time, effort and costs involved in the activity and because there are no space constraints. For forages, rationalization and prioritization for conservation is logical given the range of species. There is also potential for improving cost-effectiveness for vegetatively propagated species where costs of conservation are high. Upfront costs for cryopreservation, in particular, are very high but given that it allows very long-term storage, it is likely to be the most cost-effective means to conserve clonal material. While successful routine cryopreservation protocols for CGIAR clonal germplasm collections exist only for potato and *Musa*, promising results have been achieved for cassava and sweet potato.

During the Genebanks CRP, individual genebanks have improved their performance, and thereby their effectiveness. The external technical reviews were important for identifying issues and bottlenecks in individual genebank performance, and because funds were allocated to implement prioritized actions. Center genebanks have upgraded their operations and facilities through many activities supported by

the CRP, particularly: the QMS and capacity building associated with it; use of bar-coding in all operations; resolving seed conservation and longevity issues; expanding *in vitro* and cryopreservation approaches; and accelerating safety duplication of seed collections in the Svalbard Global Seed Vault.

Efficient, secure and reliable data management systems are essential to achieve the objectives of the Genebanks CRP, particularly making genetic resources better accessible to their users. The CRP focused on two pieces of software, namely Genesys, as a global portal for plant genetic resources information, and GRIN-Global, a genebank information management system. Genesys provides access to data on plant genetic resources maintained in international and national genebanks around the world, including the CGIAR genebanks. The CRP staff at the Crop Trust have done well to promote the use of Genesys amongst CGIAR genebanks in a relatively short space of time, and all genebanks are now contributing data to Genesys. This represents a distinct improvement over previous arrangements where global access to germplasm information was through individual genebank databases. Available data includes accession-level passport, characterization and evaluation data. Genesys is fulfilling one of its primary objectives of permitting access to information about the CGIAR genebank collections that, in turn, aim to enhance use of germplasm. Full benefit requires that all genebanks upload data frequently, which is not yet happening.

GRIN-Global is a data management system for genebanks, providing a complete genebank inventory management application. Work is underway to link GRIN-Global and Genesys, which is needed. The Evaluation Team considers that wider uptake of GRIN-Global, already used or being introduced in eight Centers, will be important because it will be replacing platforms in genebanks that are either outdated, inadequate or soon to be unavailable. However the continued lack of compatibility between breeders' data and GRIN-Global is perceived by several stakeholders as one of the issues still to be improved.

Standards, indicators and targets

The Genebanks CRP guidance to genebanks and monitoring have enhanced the conservation of the crop collections towards meeting international genebank standards set by the FAO Commission. The CRP has used a set of performance indicators to monitor how individual genebanks were upgrading their operations, making their collections safer, better documented and, ultimately, more accessible. Monitoring also demonstrates to the donors how stable funding was used to enhance genebank performance. Nevertheless, setting of the targets overlooked to some extent the challenges faced by many of the 11 genebanks, because they did not sufficiently reflect the biology and complexity of the different germplasm collections. The way targets were set did not allow consistent monitoring of incremental changes towards achieving overall conservation standards. Therefore, the reporting on targets at an aggregate level across very different collections and situations may give a wrong impression that the CGIAR genebanks are falling short in terms of their annual performance. Indeed, a "steady state" (such as elimination of regeneration backlogs, or germplasm safely duplicated at the Svalbard Global Seed Vault and elsewhere) will not be reached in all genebanks for some years to come. This is partly because crop collections continue to change in a dynamic manner, as germplasm gaps are filled (with collections potentially increasing in size) and use of new technologies permits rationalization of germplasm holdings. Concerning dissemination of accessions, new approaches to

better target useful accessions can help reduce the number of samples that need to be distributed thus affecting what targets are reflective of performance.

Lessons for the future

The Genebanks Platform builds, and expands on, on the achievements of the Genebanks CRP in areas of genebanks operations and performance. It incorporates an additional module on policy and includes research in the conservation module. These are important improvements. The policy module will help assure that CGIAR addresses - at the System level - an area that is essential both for CGIAR's own operations and its reputation and visibility, as well as international engagement and leadership in this area. It is also important that CGIAR, as a System, engages more actively in international fora - the International Treaty and the FAO Commission - and contributes its experience and expertise to negotiations that affect access to and use of plant genetic resources. Unless it becomes more active in this respect, there is a danger that policies will be put in place that could undermine CGIAR's freedom to use and exchange germplasm.

An Independent Advisory Committee has been proposed for the Genebanks Platform, being composed of four independent experts on plant genetic resources, three *ex officio* delegates from the Centers and the Executive Director of the Crop Trust. Such a committee is most appropriate, and it is very important that it has the expertise and standing to contribute to the success of the Genebanks Platform and to bring and independent perspectives to contribute to the oversight and management of the Platform. External experts can bring independent and external scrutiny and advice that will be very important to strengthen CGIAR's relationships with external bodies, and promote international understanding and transparency of CGIAR's stewardship of genetic resources.

The Genebanks CRP was established and implemented under an institutional arrangement that was unique because the CRP was managed by an organization independent of CGIAR, the Crop Trust. Given the particular strength of the Crop Trust in genetic resources management, it needs to be seen also as a valuable strategic partner, rather than just a manager. Overall, CGIAR should use the Genebanks CRP experiences, and those from the Genebanks Platform to come, to learn lessons for harnessing high level partnerships to the fullest for advancing CGIAR goals and mission. The Genebanks Platform gives CGIAR and the Crop Trust an excellent opportunity to collaborate closely on all issues related to CGIAR genebanks.

Summary of Recommendations

Recommendation 1. The System Organization should contribute to the effective governance and management of the Genebank Platform, by consistently representing CGIAR on the Crop Trust Executive Board and the Genebank Platform Management Team.

Recommendation 2. The Crop Trust Executive Board should execute a clearly defined role practicing its responsibilities in the oversight and governance of the Genebank Platform, distinguishing this role from its governing role for the Crop Trust, particularly with regard to Platform funding, its allocation, and use, and it should report the status regularly to CGIAR.

Recommendation 3. Given the shortcomings in the original Costing Study, and despite difficulties encountered earlier, the Genebank Platform management should give high priority to revisiting the Parity Study to establish realistic and transparent budget for each Center genebank.

Recommendation 4. The Genebank Platform management should subject all fund allocation proposals for approval by the Management Team, and ensure that all decisions on fund allocation are recorded in Management Team meeting minutes and available to Centers and genebank managers in order to maintain a high level of trust and transparency.

Recommendation 5. Given that the Genebank Platform is not a research program and that its mandate and aims are different from those of the CRPs, tailor-made reporting format needs to be agreed for the Platform. Therefore the Genebank Platform management and the CGIAR System Management Office should, at the earliest opportunity, agree on bespoke reporting needs and format to serve CGIAR and the wider genetic resources community better.

Recommendation 6. The Crop Trust should incentivize and empower the Genebank Platform management to promote the Platform independently from the Crop Trust's own communications, in order to ensure that a comprehensive communications strategy is developed to promote the visibility and accountability of the Platform and the CGIAR genebanks. Furthermore, the Genebank Platform Management Team should use the communications strategy effectively for:

- promoting the work, progress and achievements of the Genebank Platform and its component modules;
- promoting cross-Center activities, details about germplasm exchange, and use of Standard Material Transfer Agreements;
- publishing minutes from the Genebank Platform meetings, including the Annual Genebank Managers meeting; and
- supporting recognition of the historic and current efforts of the CGIAR Centers as some of the main custodians of genetic resources worldwide.

Recommendation 7. Given that the Quality Management System has become a key mechanism for enhancing genebank operations, the Genebank Platform should build on this success by:

- compiling lessons learned from Quality Management System to operationalize the FAO Genebanks Standards into easily implementable approaches and procedures, and report

- regularly to the FAO Commission on their use which would help genebanks worldwide to enhance their performance;
- determining, at the earliest opportunity, if external validation of Quality Management System is needed and if so, what form it should take, and to whom such a validation role might be assigned.

Recommendation 8. Use of germplasm for research and crop improvement requires access to germplasm that has been adequately characterized and evaluated for resistance to and tolerance of biotic and abiotic stresses. In its future data development efforts, the Genebank Platform management should:

- enhance linkages between genebank characterization and breeders' evaluation and pedigree data; and
- expand the utility of GRIN-Global more specifically for *in vitro* collections.

Recommendation 9. For ensuring CGIAR's effective engagement in genetic resources policy dialogues and regular representation at international fora, the FAO Commission and the Governing Body of the International Treaty in particular, the System Management Board should oversee that the System Organization, Centers, and the Crop Trust as manager of the Genebank Platform clearly define and agree on their respective roles and responsibilities regarding representation of CGIAR internationally, taking into consideration that the Genebank Platform's policy module reports to the System Management Board/General Assembly.

Recommendation 10. Given that close linkages between the Genebank Platform and the Excellence in Breeding and Big Data Platforms will be essential for strengthening genetic conservation and use, the Genebank Platform Management Team should agree with the managements of the other two Platforms appropriate protocols for data exchange and use. This coordination will take advantage of CGIAR's unique position of spanning the whole range of activities from conservation to use, and minimize the Platforms developing as silos in isolation from one another.

Recommendation 11. Given the broader mandate of the Genebank Platform compared to the Genebanks CRP, the Crop Trust Executive Board should ensure strong strategic leadership and vision for the Genebank Platform either through establishing an additional position (of a Platform Manager) to those currently described in the Platform proposal or by expanding the role of the Platform Coordinator.

1 Introduction

1.1 Purpose

The CGIAR program for *Managing and Sustaining Crop Collections* is a research support program, hereafter referred to as the Genebanks CRP (CGIAR Research Program). Genebanks CRP was approved for five years (2012-2016) for the management and the sustainable funding of the crop collections held in the genebanks of 11 CGIAR Centers. The CRP is a partnership between the CGIAR Consortium and the Global Crop Diversity Trust (hereafter referred to as the Crop Trust). It represents a unique institutional arrangement for CGIAR because the "Program Manager", the Crop Trust, is a non-CGIAR entity, which together with the CGIAR Consortium had responsibility for the dual governance of the CRP.

The primary purpose of this Evaluation is to support the improvement of the efficiency, effectiveness and sustainability of the management of CGIAR's genebanks for secure conservation and ultimately enhanced use of the collections of plant genetic resources for food and agriculture (PGRFA).

The Evaluation provides an assessment of the CRP's performance since its beginning and provides lessons and recommendations to strengthen the operations and management of the Genebank Platform in the next phase. The Evaluation assesses the extent to which the CRP has made progress in achieving the desired results according to its objectives and has brought about positive changes in key areas of activity. The Evaluation will also provide lessons on CGIAR System-level issues related to genetic resources conservation and use over and above what was included in the CRP under the new arrangement.

1.2 Structure of the Evaluation report

The Evaluation report consists of four chapters. The introductory chapter presents the background and context for the Evaluation, including a brief overview of the Genebanks CRP and a summary of the Evaluation approach and methodology. Chapters 2 to 4, on *Governance and Management, Efficiency and Effectiveness*, and *System Level Lessons from Phase I*, respectively, present the findings and conclusions of the Evaluation and the recommendations derived there from.

1.3 International framework for genetic resource conservation in CGIAR

The *ex situ* crop collections in CGIAR, held in genebanks of 11 CGIAR Centers, are among the largest and most diverse globally and of major importance for agriculture and food security. Since 1994, when Centers signed agreements with FAO, the collections have been held in trust under the auspices of FAO for benefit of the international community. The International Treaty on Plant Genetic Resources for Food and Agriculture (hereafter, the International Treaty), negotiated by the FAO Commission of Genetic Resources for Food and Agriculture (hereafter, the FAO Commission), came into force in 2004. It legislates for access of agriculturally important plant genetic resources under a Multilateral System of Access and Benefit Sharing. Article 15 of the International Treaty provides the legal framework under

which the *ex situ* collections of plant genetic resources for food and agriculture are held by CGIAR Centers and other international institutions.

CGIAR Centers, through formal agreements with the International Treaty, have put their collections under the purview of the International Treaty as part of the Multilateral System. These collections comprise mainly crops that are included among the 64 Annex 1 crops of the International Treaty subject to the Multilateral System. However, crops outside Annex 1 were also included in the agreements signed by the Centers.

The Crop Trust was established in 2004 as an independent international organization focusing exclusively on *ex situ* conservation of plant genetic resources. It was recognized as an essential element of the funding strategy of the International Treaty. The endowment established by the Crop Trust is intended to support conservation of the most important crop diversity in perpetuity, including the crop collections in the CGIAR genebanks. In addition to supporting plant genetic resources collections, the Crop Trust is engaged in other activities that concern CGIAR; most importantly the Svalbard Global Seed Vault, which represents a backup of the world's genebank collections. At the start of the Genebanks CRP, the Crop Trust already had bilateral contractual arrangements with individual Centers to support the conservation of specific crop collections.

In the Genebanks CRP proposal, the International Treaty, the Fund Disbursement Strategy of the Crop Trust endorsed by the Governing Body of the International Treaty, and FAO's Global Plan of Action were considered as providing the higher-order framework for management of the CGIAR collections under the CRP. The Governing Body of the International Treaty provides policy guidance related to the CGIAR collections. CGIAR is expected to report periodically to the Governing Body about its genetic resources activities.

1.4 The evolving CGIAR context

The Evaluation has been conducted at a time when there have been changes in CGIAR, in terms of CRP portfolio and System-level governance and management. In the 1st cycle of CRPs, that included 15 research programs and the Genebanks CRP, the programs were approved and started their operations over a two year period as part of implementation of the CGIAR Reform³. In preparation for the second cycle of CRPs starting in 2017, CGIAR proposed a revised program portfolio. It consists of twelve CRPs and three platforms of which the Genebank Platform is one, building on the Genebanks CRP. While the Evaluation has been going on, the CRPs and platforms went through proposal review, revision and approval. The Genebank Platform, approved in November 2016, differs from the Genebanks CRP mainly in having three integrated modules that, in addition to conservation, include use and policy. The Genebank Platform starts its operations in January 2017. In 2016 CGIAR has also gone through a governance transition resulting in a System Council (replacing the Fund Council) and System Organization (replacing the Consortium). The new System Organization consists of a System Management Board, with largely Center representation, and System Management Office. These new System units have responsibility on governance and accountability of the CRPs and Platforms.

³ <http://www.cgiar.org/about-us/our-programs/>

1.5 Overview of Genebanks CRP

The trigger and necessity for establishing the Genebanks CRP came from the CGIAR Reform that shifted research implementation from a Center model to a program model. Under the new CGIAR financing model, “unrestricted” funds (referred to as Windows 1 and 2 funds) were designed to support only research programs (CRPs), which was not in line with covering the costs for regular and routine operations of genebanks. At the same time, a core element such as a genebank could also not be defined as an overhead cost.

The Genebanks CRP was approved in 2012 for five years for the management and sustainable funding of the collections of plant genetic resources held by 11 CGIAR Centers. It was established as a partnership between the Crop Trust and the CGIAR Consortium. The Crop Trust received this role because of its mandate of supporting the conservation of crops important for food and agriculture and development of a global system for their professional management and funding in perpetuity.

The endowment, which is the Crop Trust’s main mandate, was intended to become the mechanism for financial support in perpetuity for the conservation of international crop collections, thereby solving the issue of sustainable and secure funding. Until the Crop Trust endowment was completed, the funding for CGIAR genebanks was to come also from other sources, mainly Window 1, and therefore the CRP was created as a research support program that does not engage in research.

The Genebanks CRP’s purpose is to conserve the diversity of plant genetic resources in CGIAR-held collections and to make this diversity available to breeders and researchers in a manner that meets high internationally agreed genebank standards, in a manner that is cost-efficient, secure, reliable and sustainable over the long-term, and is supportive of and consistent with the International Treaty.

As per the proposal submitted in 2011, the Genebanks CRP has the following four objectives:

- crop and tree diversity in international collections under Article 15 of the International Treaty is secured in perpetuity;
- conserved crop and tree germplasm is clean, available and disseminated;
- use of conserved crop and tree diversity is informed and facilitated; and
- crop and tree diversity is conserved within a rationalized, cost-effective and globalized system.

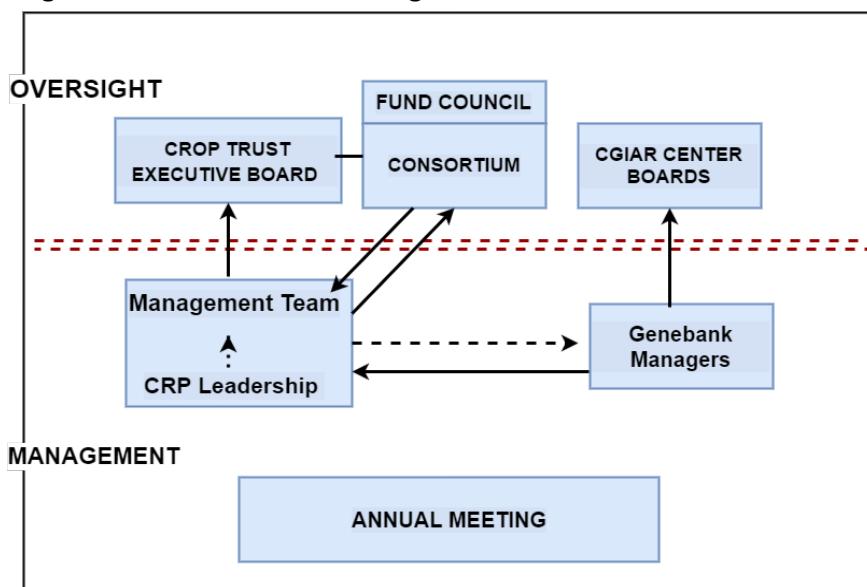
1.6 Governance and management

The Genebanks CRP was established as a partnership between CGIAR and the Crop Trust that became the “Program Manager”. The governance and management of the CRP thus differ from those of other CRPs. Figure 1 illustrates the governance and management arrangements of the CRP and responsibilities of the governing and management bodies, as well as the relations with Center genebank management and oversight.

The key CRP management mechanisms comprise a leadership group of Crop Trust staff (initially the Deputy Executive Director, a CRP Coordinator, and finance staff) and a broader Management Team. Originally the Management Team included only Crop Trust staff (providing both technical and financial expertise) and representative of the Consortium Office, but was expanded in late 2013 to include three representatives of managers of the 11 Center genebanks. The CRP has also organized annual meetings,

designed as part of its Monitoring and Evaluation process, with participation of all genebank managers, Consortium Office and a limited number of key external partners.

Figure 1: Governance and Management of Genebanks CRP



Source: Simplified from CRP proposal

In the Genebanks CRP proposal, core processes in the dual governance arrangement included the Crop Trust Executive Board's oversight of the CRP management, and accountability to the Consortium Board on CRP performance as per the performance contract. The Consortium Office was given the responsibility to follow-up on the Consortium Board's decisions concerning CRP implementation and synergies among CRPs. Consortium Office was also given a role for overall coordination of both issues that cut across genebanks and emerging genetic resources issues, and it therefore had membership in the Management Team.

In accordance with the Crop Trust's Constitution, the Executive Board of the Crop Trust is set to include the following members:

- four members appointed by the Governing Body of the International Treaty, at least two from developing countries;
- four members appointed by the Donors' Council of the Crop Trust;
- one non-voting member appointed by the Director General of the FAO;
- one non-voting member appointed by the Chair of CGIAR who shall operate in a technical capacity only;
- two members appointed by the Board itself; and
- the Executive Director of the Crop Trust, ex officio.

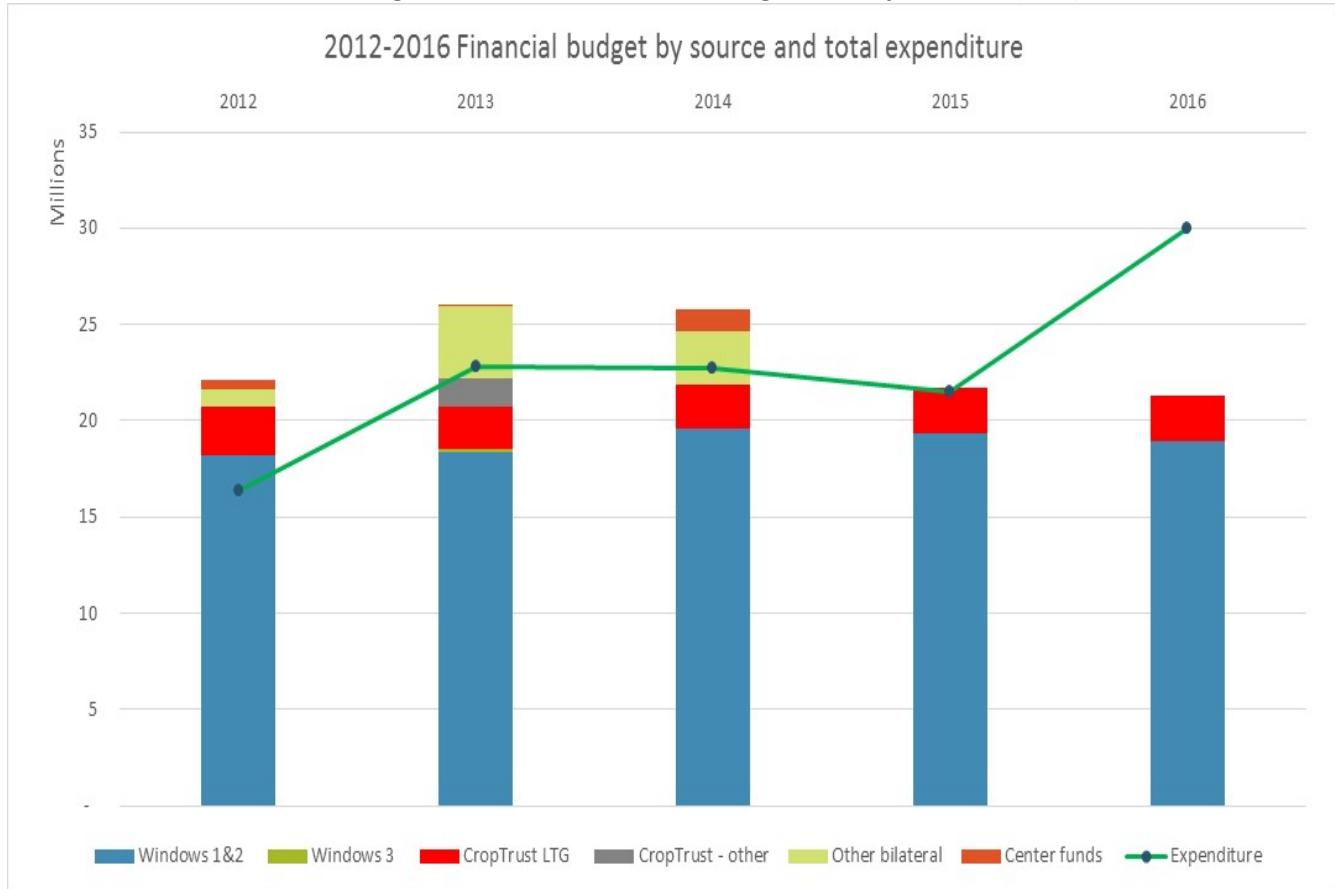
1.7 Source of Funding and Budget

It was foreseen that Center genebank operations through the Genebanks CRP would be funded from different sources - the Fund, the Crop Trust's endowment and other sources - with the endowment becoming the predominant source towards the end of the program (2016).

Report of the Genebanks CRP Evaluation

In the five years, the CRP budget (which has averaged USD 24 million a year) has come primarily from Window 1 (approximately 80 percent across the five years), which is unrestricted funding. Other funding sources have been Long-Term Grants coming from the Crop Trust endowment, bilateral grants and Center funding. The Crop Trust endowment contribution to genebank operations has remained relatively small, USD 2.3 million annually on average, and it has increased annually by 2.2 percent since 2012. CRP budgets and expenditures by funding source are shown in Table 1 for the five years of operation.

Table 1: CRP annual funding from different sources – budget and expenditure (USD)



Funding Source	2012	2013	2014	2015	2016
Windows 1&2	18.2	18.4	19.6	19.4	18.9
Window 3		0.1			
Crop Trust (LTG)	2.5	2.2	2.3	2.3	2.4
Other bilateral	0.9	5.2	2.8	0.0	0.0
Center funds	0.4	0.1	1.1	0.0	0.0
Total Budget	22.1	26.1	25.8	21.7	21.3
Expenditure	16.4	22.8	22.7	21.5	30.0

*Non audited results for 2016.

2016 expenditures include carry over amounts from previous years. Source: CRP financial reports 2012-2016 (non-audited 2016 figures)

The cost estimates to fund routine costs for genebank operations came from a Costing Study commissioned by the CGIAR Consortium and the Crop Trust, and conducted by three independent

consultants, one of whom was acting Finance Director for the Consortium Office at the time⁴. Costing of the World Agroforestry Center (ICRAF) genebank routine operations was done at a later date. Table 2 shows accumulated program expenditures for individual genebanks over five years.

Table 2: Total accumulated Expenditure by Center in 2012-2016 (in millions)

Genebank Center	Total funding	TOTAL expenditure	% of total CRP
AfricaRice	2.6	2.6	2.27%
Bioversity	7.1	6.9	6.11%
CIAT	14.9	14.7	12.92%
CIMMYT	9.7	9.4	8.28%
CIP	20.9	20.9	18.42%
ICARDA	11.1	10.4	9.21%
ICRISAT	13.6	13.1	11.55%
IITA	8.1	8.1	7.14%
ILRI	6.8	5.7	5.00%
IRRI	8.6	8.6	7.60%
TOTAL	108.8	106.3	93.7%

Source: CRP Financial reports 2012-2016 (2016 figures are non-audited)

The Genebanks CRP also funds other activities, additional to core operations as identified in the Costing Study including following type of technical activities: gap analysis and collecting (to identify and address gaps in collection), and molecular characterization strictly for clonal collections and biochemical characterization for forages. In addition, following the CRP commissioned external reviews of individual genebanks, the CRP subsequently provided funds to respond to priority actions highlighted by the review, some of them as critical, but falling within the overall genebank core operations identified in the Costing Study. Prioritization of these actions was done by the CRP management in consultation with the Center, resulting in a Recommendation Action Plan (RAP) for each Center.

The CRP budget also includes management costs, in the range of USD 0.5 million per year, to cover salaries of Crop Trust staff allocated to the CRP, as well as program costs, approximately USD 0.3 million per year, to cover annual CRP meetings and external reviews.

⁴ Shands et al. 2010 (Annex 4 of the linked report):

Table 3: Annual expenditure by CRP activity area (in millions)

Expenditures	2012	2013	2014	2015	2016	TOTAL
Genebank Core Operations	14.08	15.96	15.93	16.40	19.18	81.55
ICRAF	0.34	0.87	1.11	1.02	1.79	5.14
Cryobanking	-	0.19	0.46	0.60	1.01	2.25
Additional acquisitions and collecting	-	0.04	0.15	0.09	0.02	0.30
Optimizing collections	-	-	0.22	0.56	3.28	4.06
Global Outreach , capacity building	-	0.07	0.31	0.78	2.14	3.29
Data systems (Genesys, GRIN Global)	-	0.23	0.22	0.18	0.44	1.08
Management & Program Costs	0.73	0.87	0.89	0.88	1.09	4.45
ICARDA Investment Plan	-	-	0.07	0.84	0.70	1.61
Bioversity Overhead	-	0.38	0.03	0.03	0.03	0.45
CropTrust bilateral projects	-	0.23	0.43	0.16	0.31	1.13
Projects funded by other bilateral donors, Window 3 and Center funds	1.21	3.99	2.93	-	-	8.13
Total	16.36	22.82	22.73	21.53	30.00	113.44

1.8 Evaluation scope

The Evaluation scope was determined both by the specific mandate of the Genebanks CRP on one hand and the System-level needs with regard to *ex situ* genetic resources on the other hand. Thus the Evaluation covered primarily all activities of the Genebanks CRP since its initiation in 2012. The Evaluation assessed the management and governance roles, responsibilities and relationships of the Center genebanks, Genebanks CRP Management Team, the Crop Trust, the Consortium Board and Office, and the Fund Council. The Evaluation assessed the development, set-up, implementation and funding of the Genebanks CRP and achievement against its objectives and progress to-date. It also assessed the continued appropriateness and realism of program objectives as the Genebanks CRP transforms into Genebank Platform in Phase II. Broader System-level issues concerning *ex situ* genetic resources that were not specific mandate of the Genebanks CRP are also covered in the Evaluation, including policy with regard to genetic resources, representation of CGIAR and communication about its genebanks. The Evaluation did not assess the Crop Trust *per se*, or its fundraising activities, although the transition to sustainable funding through the endowment was an intrinsic component of the CRP.

Given the transition in 2017 from Genebanks CRP to Genebank Platform, the Evaluation presents an account of the Genebank CRP's performance and achievements. On basis of the lessons from the CRP specifically and CGIAR's System-level issues concerning genetic resources overall, the Team made recommendations for the future.

In the summative assessment, the Evaluation covered the extent to which the Genebanks CRP has made progress towards achievement of its objectives. Looking forward, the Evaluation explored the potential for increasing efficiency and effectiveness of central genebanks management operations in the future. It also addressed financial sustainability and realization of the endowment, integration and

synergy across Centers and CRPs and implications of experiences from management and governance as the program moves forward to become the Genebank Platform.

1.9 Approach and methodology

Details of the Evaluation approach and methodology can be found in the Evaluation Inception Report⁵. A summary is given here. Following consultation with stakeholders at the Crop Trust, FAO and CGIAR, the Evaluation Team formulated four Key Questions and one Overarching Question (listed below) to focus on, basing these on the preliminary set of questions in the Evaluation Terms of Reference⁶. Key Question A, related to Efficiency and cost-effectiveness: Has the Genebanks CRP enhanced the management (and use) of CGIAR crop collections?

Key Question B, related to Effectiveness: Has the Genebanks CRP enhanced the technical performance of Center genebank operations?

Key Question C, related to Sustainability: How has the Genebanks CRP improved the security of CGIAR crop collections?

Key Question D, related to Management and Governance: Has the Genebanks CRP been well managed and appropriately governed?

Overarching Question: What has been the value added from the unique institutional arrangements of the Genebanks CRP?

The Team also formulated a set of second order questions (shown in the Evaluation Matrix in the Inception Report) and listed key groups of informants, sources of other evidence and evaluation tools for addressing those questions. A key document was an Achievements Matrix (see Annex 4) that was prepared by the CRP Coordinator at the request of the Evaluation Team for assessing progress and achievement. The Team used this matrix for validating its information through multiple methods of evidence gathering and triangulation.

The Team used the following sources of evidence for addressing the evaluation questions and as basis of its findings and conclusions that subsequently led to the recommendations:

1.9.1. Document review

The list of documents consulted by the Team is given in Annex 1. The main documents reviewed included: official governance and management records such as: CRP management Meeting minutes, Crop Trust Board meeting summary; Fund Council meeting records, Consortium Board summary records, CRP annual financial and technical reports and Achievement Matrix (developed by Crop Trust following request by Evaluation Team); 2015 Internal Audit Report for Genebanks CRP.

⁵ Genebanks CRP inception report <http://www.iea.cgiar.org/sites/default/files/Inception%20Report-Genebanks%20CRP.pdf>

⁶ http://www.iea.cgiar.org/sites/default/files/ToRs_Genebanks%20Evaluation.pdf

1.9.2. Interviews

The Team interviewed over 200 persons either face-to-face or virtually. The CRP coordinator was also consulted frequently for information. Those interviewed represented the following stakeholder groups:

- CRP Management Team
- Staff at the Crop Trust
- Center genebank managers
- Quality Management System (QMS) manager (during field visit)
- Center genebank international and national staff (during field visits)
- Center staff representing users and stakeholders of genebanks
- External users in national genebanks and external experts
- Representatives of FAO Commission and the International Treaty
- Representative of Center and the Crop Trust governance
- Staff at the Consortium Office and Fund Office

1.9.3. Surveys

To collect information and perceptions in a systematic way across two groups of stakeholders, the Team conducted an email survey of Center senior management (through Directors General) and donors who contribute significantly to CGIAR, particularly through Window 1.

All interviews and surveys were done in confidence and their results were used with other evidence in triangulation and presented in summary form.

1.9.4. Field visits

The Evaluation Team selected representative sites for field visits taking the following into consideration: crop collections conserved, conservation methods used, as well as number of crops in collection. The Team also considered location, to identify where travel would allow more than one site visit.

The Team visited the following Centers: CIAT, CIMMYT, CIP, ICRAF, ILRI. Each site visit included two team members (the Team Leader in all instances, and one other member). Site visits included in-person interviews with genebanks managers and national genebank staff, senior management, finance directors and staff, selected scientists from the Center (breeders), as well as (when applicable) data managers who are involved in the program. Team members also met with the QMS manager for in depth discussion on the QMS system as well as the ORT reporting. Site visits also included, when possible, visits to national genebanks and meetings with the senior staff of the national genebanks. In addition, the Team Leader and one additional team member participated in the Annual Genebank Managers meeting (AGM) in Australia.

1.9.5. Factual data

The Evaluation Team analyzed factual data on genetic resources routine operations and flows to assess changes and variance in operations. The Online Reporting Tool (ORT) was an important source of information, and demonstrated to the Evaluation Team.

1.9.6. Resource persons

The Team (see Annex 2) was supported by a group of resource persons (see Annex 3) to review the Evaluation Inception Report and Final Report before they were finalized and to provide insights in in their specific area of expertise.

1.9.7. Limitations to the evaluation

The Genebanks CRP Evaluation was the last of a total of 16 CRP Evaluations that were intended to inform the development of the Phase II CRP proposals. Given the short period during which these Evaluations needed to be completed, the Evaluation of this CRP was conducted during the period when the Genebank Platform proposal was assessed and also approved in 2016, which limited its use in the approval process. In formulating its recommendations, the Evaluation Team took into consideration the changes in the Genebanks Platform and the extent to which any issues of concern from this Evaluation appear to be addressed in the Platform.

The Evaluation's ability to assess whether the Genebanks CRP activities have resulted in enhanced use of CGIAR crop collections was limited as use is only indirectly affected by the management of genebanks. Rather, the Evaluation focused on aspects of management, such as information management, that are intended to enhance use.

A further limitation to the Evaluation was the fact that stakeholders who have interest and knowledge of CGIAR, genetic resources and genebanks, were often not familiar with the CRP. Therefore, the Team's ability to get informed perspectives on the Genebanks CRP from outside CGIAR were limited.

2 Governance and Management

The first section of this Chapter provides the Evaluation Team's analysis and assessment of the adequacy of the roles played by the Crop Trust and CGIAR in governance of the Genebanks CRP, and CGIAR's stewardship of genetic resources over and above the CRP, given the institutional arrangements after the CGIAR Reform. The Evaluation also assessed the implications of CGIAR's governance role in the CRP on the governance of the Centers with genebanks.

The second section presents an assessment of the Genebanks CRP management within the Crop Trust and its relationship with its immediate stakeholders, those with responsibilities related to the Genebanks, the Management Team and its composition and operation, and overall conduct of management, including financial management.

The Evaluation Team based its findings on the following sources of evidence, especially: the Scoping Study commissioned by the Consortium in 2012; Genebanks CRP proposal, Genebanks CRP Audit report 2016; meeting minutes of the Consortium Board, Fund Council, the Crop Trust Executive Board, Genebanks CRP Management Team, and AGMs; interviews with representatives of the Consortium Office and Fund Office, FAO Commission and International Treaty, and Center genebank management; and written responses from Center senior management and donors. The Genebank Platform proposal was taken into account.

2.1 Governance

The genebanks of CGIAR represent a global asset with both instrumental and inherent value. The individual genebank collections are held in trust by Centers. However, the establishment of the Crop Trust and the development and funding of the Genebanks CRP acknowledge a broader responsibility, globally and System-wide, to assure the safety and sustainability of the collections, and to optimize their current and future value.

The establishment of CRPs across Centers and pooled funding arising from the CGIAR Reform had particular implications for the oversight of genetic resources in CGIAR and the management of the CRP. A dual governance arrangement was agreed for the Genebanks CRP; it envisaged oversight of the CRP management by the Crop Trust and accountability for CRP performance to the CGIAR System (and the Fund Council) through the Consortium Board. Thus, the governance arrangements for the Genebanks CRP has differed from those of the other CRPs, where management oversight and governance responsibility rests with centers. The Genebanks CRP was established through a tripartite agreement with Bioversity International included as the legal Lead Center⁷. For the Genebanks CRP, the Consortium was given an explicit role in the CRP's governance as well as its management, which reflects the System-wide nature of the CRP and the System-level responsibilities of the Consortium. Prior to the Reform, there were two entities with System-level functions with respect to genetic resources. The System-wide Genetic Resources Program (SGRP) operated from 1994 until 2010 as a

⁷ Bioversity International's only role has been to receive funds from the Fund Council and to disburse them to the Participating Centers following instructions received from the Crop Trust as Project Manager. Since the Crop Trust itself is not part of CGIAR, it cannot receive any funds, except for its own remuneration as Project Manager.

forum for collective action among CGIAR genebanks, concerning, for example, policies, strategies, representation and genetic resource information system (SINGER). It reported regularly to the FAO Commission. The Genetic Resources Policy Committee (GRPC; also from 1994 to 2010) provided CGIAR community and System governance advice and recommendations on policy issues, focusing on political, legal, and ethical issues. With the CGIAR Reform, these two entities were discontinued, and these functions became the responsibility of the Consortium to manage and facilitate. Since closure of the GRPC, the CGIAR System has not had an advisory body for genetic resources policy issues, as policy aspects were not included in the Genebanks CRP.

During the transition period and prior to the development of the CRPs, the Consortium Board commissioned a “CGIAR Genetic Resource Scoping Study” to investigate whether “genetic resources research and conservation activities are sufficiently incorporated in CRPs”, identify gaps or duplications, and provide recommendations for the Consortium Board’s consideration. The Board considered actions to address the issues raised in the Study in parallel with development of the Genebanks CRP. The report resulted in 21 recommendations, which included the need for a system-level advisory mechanism for policy and international representation, as well as the need to develop a genetic resources research and services platform for CGIAR. In terms of funding of genebanks, the Scoping Study highlighted the need for Tier 1 annual funding (i.e. routine operations identified by the Costing Study), as well as Tier 2 for one-time costs, upgrading, and facilities.

The Evaluation assessed both the governance performance related to the CRP given the dual governance mechanisms, and the performance of CGIAR leadership with respect to the System’s genetic resources issues in the reformed CGIAR.

2.1.1. Role of the Crop Trust

The Crop Trust is the “Program Manager” of the Genebanks CRP on behalf of CGIAR, and its Executive Board has the primary role in the governance of the CRP. The Board is responsible for “[exercising] oversight of [CRP] management to ensure the full execution of the performance contract”⁸. This includes financial accountability (to the Consortium), risk assessment, and assurance that appropriate systems and policies are in place. In addition to the CRP, the Crop Trust has several projects of its own, but the Genebanks CRP is the largest in terms of budget and scale of activity.

Given the Crop Trust’s role in governance and management, the Evaluation Team considered the membership profile of the Executive Board of the Crop Trust. Based on consideration of Board member biographies and testimony from stakeholders, the Evaluation Team considers that the Board has the expertise and sufficient independence to provide effective oversight of the Genebanks CRP. On the basis of an analysis of the meeting minutes of the Board, and the overall positive assessment by the Evaluation Team of the first phase of the Genebanks CRP (assessed in detail in the next Chapter), the Evaluation Team concludes that, overall, the governance of the Genebanks CRP by the Crop Trust has largely been effective. The Crop Trust Executive Board received reports from the CRP management on scientific issues related to the CRP. Board discussion of the CRP has centered on the CRP’s development, the partnership with CGIAR, CRP developments and linkages to other Crop Trust initiatives, such as the Crop Wild Relatives Project. However, the Evaluation Team noticed some

⁸ CRP proposal, pg 26.

deficiencies in the Executive Board's oversight of the CRP. The Executive Board did not receive specific CRP reports and updates and items related to the Genebanks CRP did not seem to be clearly differentiated from other topics, such as scientific reporting.

As is discussed later in this chapter, despite the dual governance arrangement that was integral to the oversight for the CRP, the CGIAR Consortium did not fill the representative seat in the Crop Trust Executive Board for some years. At the end of 2015, the Consortium Board took steps to remedy the situation, although a dedicated representative has yet to be nominated.

As the Evaluation began, various stakeholders raised the issue of conflicts of interest resulting from the Crop Trust's management of the CRP. In addressing the issue, the Evaluation Team considered three areas where there is potential for conflict. The first area involves the potential for programmatic and financial conflicts of interest that derive from the governance and management of a CRP by an organization "outside" CGIAR that has its own mandate, goals and priorities. The Crop Trust is also a donor to the program, along with its technical and financial management commitments, and the endowment is intended to form a major part if not full funding of the genebanks operations in the future. The second concerns policy development and representation where the Crop Trust and CGIAR should have differentiated roles. The third area for potential conflict of interest is in communications.

Concerning the first, the Evaluation Team asked the question, "To what extent has there been a need for the Crop Trust to adjust its role since the inception of the program?" to explore precisely how a rapidly increasing endowment contribution to the CRP funding would influence the Crop Trust's governance and management roles and the potential for conflict of interest.

Given that its annual financial contribution to the Genebanks CRP over the past five years has never exceeded 20 percent (see Table 1 in Chapter 1), the Crop Trust is presently a minor financial stakeholder (but major technical stakeholder) in the CRP compared to the Window 1 contributions earmarked from CGIAR funds for the CRP and allocated for specific purposes in the performance agreement.

While the slower than expected growth in the endowment has been regrettable, the Evaluation Team considers that there is limited risk now or in the near future of conflicts of interest in the Crop Trust being the CRP manager with respect to financial or programmatic matters. The Crop Trust's accountability to the Consortium Board and the Fund Council for the CRP's finances and performance is unambiguous, and, as noted above, the Crop Trust Executive Board has independent members who provide an additional level of assurance. Nevertheless, as the endowment grows, and the Crop Trust becomes the major funder of the Genebank Platform, the potential for conflict of interest also grows as the Crop Trust provides more funds, and potentially has more control over their allocation and management, and the Evaluation of results. As a major provider of funding, the Crop Trust will be more vulnerable to questions about conflicts between its interests and the interests of stakeholders, including CGIAR. Therefore, the Evaluation Team finds it important that the terms of governance and management agreements between CGIAR and the Crop Trust continue to minimize that risk and that each partner plays its role in a conscientious and transparent manner.

The Crop Trust is a partner with CGIAR in strategy development and priority setting, with CGIAR and its donors taking the lead on behalf of the Centers as the "asset holders," and currently providing the major source of funding. Based on the growth projections of the Crop Trust endowment fund, and its

anticipated contributions to the CGIAR genebanks, it will be important to maintain the partnership and a structure that supports mutual accountability when potential conflicts of interests related to financing become more critical. This could include more specific agreements about the resolution of disputes or concerns between the Trust and the CGIAR or the Crop Trust and Centers arising from perceived conflicts of interest.

Concerning the second area where there could have been a conflict of interest; the mandate of Genebanks CRP did not include policy. The Crop Trust, as an independent, international organization distinct from CGIAR, has its own policy perspectives and priorities, as well as a relationship with the Governing Body of the International Treaty and the FAO Commission. The Crop Trust has its own projects with their own policy dimensions. The Crop Trust does not engage in crop improvement directly as such, and policies relating to access to and use of genetic resources (that affect much of what CGIAR does) are broader than the Crop Trust's specific conservation focus. Given the Crop Trust's own role in policy, the Crop Trust considered that it could not represent CGIAR on policy matters without the potential for conflict of interest. For the future, the Genebank Platform has a module on policy where the coordinator reports to the System Management Board and the CGIAR General Assembly.

As noted earlier in the report, the shift in responsibility for policy development from two long-standing committees of CGIAR to the Consortium resulted in the lack of clear mechanisms within CGIAR to address policy matters. The loss of "voice" and representation in these areas created a vacuum and inability to provide a balance of interests within the Crop Trust/CGIAR partnership.

Regarding communication, there was lack of clear responsibility, strategy and resources and this led to a situation where the accomplishments of the CRP were associated with the Crop Trust rather than with CGIAR and the Center genebanks. Rather than an actual conflict of interest, the Evaluation Team considered that the shortcoming resulted from lack of attention of the Crop Trust in particular, but also the Consortium to the need for the CGIAR to be visible as the guardian of the crop collections. Communication is addressed in more detail in section 2.4.

In the Evaluation Team's view, the Independent Advisory Committee suggested by the Genebank Platform, which would play a similar role as in other CRPs, can play an important additional role to minimize the perception of conflict as well as ensure against potential conflicts of interest in the long run, particularly if it has sufficient external representation and broad perspectives in strategic directions, and plays a part in monitoring resource allocations and results for the conservation and use of genebank collections.

2.1.2. Role of CGIAR

In CGIAR, the Consortium Board and Office and the Fund Council have all been involved in System-level oversight of the CRPs and, considering CGIAR's international obligations and reputation, in genetic resource issues in general.

From the outset of the Genebanks CRP, the Consortium was expected to assume specific roles in the governance and management of the CRP. The CRP proposal envisioned a critical partnership between the Crop Trust and the CGIAR (principally by the Consortium through the Consortium Office). It detailed

the Consortium Office's role in ensuring implementation of the CRP and for coordinating "both the issues that cut across the genebanks and emerging genetic resource issues"⁹.

Consequently, the Consortium Board was expected to appoint a (non-voting) representative to the Crop Trust Executive Board, and the Consortium Office was to be a member of the Management Team of the CRP (a role it has not played in other CRPs). The Consortium Office's role was not to provide day-to-day management, but to: promote coordination and synergies at the system-level and across the CRP portfolio; facilitate communication; provide feedback; and participate in planning.

Through interviews, the Evaluation Team learned that the role of the Consortium was primarily the concern of the Consortium Office, and it was at the discretion of the leadership of the Consortium Office to bring matters to the attention of the Consortium Board. The Consortium Board discussed the CRP regularly, but (as per interviews and the Consortium Board meeting minutes) approached the Genebanks CRP as primarily a financial arrangement with the Crop Trust. Consequently, the Board focused with few exceptions on financial matters, primarily the approval of funding for the CRP. Subsequently, the Consortium Board in 2015 also reviewed and endorsed a paper "Options for funding core activities of the CGIAR Genebanks 2017– 2021"¹⁰, which was presented to the Fund Council.

The Crop Trust Executive Board minutes show that the Consortium was represented at the Executive Board's meetings for the first 18 months of the CRP (four meetings), but was then absent from meetings until 2016. The CGIAR representation at the CRP Management Team meetings was also irregular (see section 2.2.2 for further discussion). Consequently, information necessary for effective oversight did not flow to the Consortium Board from either the CRP or the Crop Trust Executive Board. In documented exchanges concerning annual reporting, interviews, and from the 2016 Audit report, the Evaluation Team perceived tension and strained relations between the Consortium Office and the CRP management at the Crop Trust (also discussed in the context of management and reporting).

The lack of follow-through and engagement in the CRP's governance and management deprived the program of a "senior" partner" able to complement the role of the Crop Trust in planning and decision-making. In addition, it affected interactions between the Crop Trust, Centers' leadership and the Consortium Board about System-wide issues at a more strategic level. A stronger, more effective role at the Consortium level might also have enabled Directors General and Center Board Chairs to remain current on the Crop Trust's progress in building its endowment.

The restructuring that resulted from the Reform created a void in the coordinated representation of CGIAR in international fora, FAO in particular. With the closure of the SGRP, it became unclear who would report on CGIAR activities or represent CGIAR on policy matters. While CGIAR official reports continued (for example to the FAO Commission), the coordinated reporting mechanism and "single voice" were lost. In its interactions with representatives of international bodies, the Evaluation Team developed a clear sense of a decline in the visibility, representation and engagement of CGIAR on behalf of the System's genebanks.

⁹ See Genebanks CRP proposal, pages 26-27 ¹⁰ Document available online: <http://www.cgiar.org/wp-content/uploads/2015/04/Options-for-funding-core-activities-of-the-CGIAR-Gene-Banks.pdf>

¹⁰ Document available online: <http://www.cgiar.org/wp-content/uploads/2015/04/Options-for-funding-core-activities-of-the-CGIAR-Gene-Banks.pdf>

Given the breadth and significance of the System's collections and the void in CGIAR representation, there was a legitimate and logical basis for the Consortium to play a larger and more direct role in policy development. Review of the Consortium Board minutes revealed that the Board initiated thinking on replacing the GRPC with an advisory board on policy. However, no further action was taken. As a result at the System level, CGIAR's role in policy development on genetic resources has been passive during a period when the international policy debate has been dynamic (agreement on the Nagoya Protocol, and status of the implementation of the International Treaty, to name a couple of significant developments).

The new Genebank Platform incorporates a module on policy with Bioversity International taking the lead. The Evaluation Team considers this an important improvement for assuring that CGIAR addresses, at the System level, an area that is essential both for CGIAR's own operations and its reputation, as well as international engagement and leadership in this area.

At the Fund Council level (as evidenced through the Fund Council meeting documentation and decisions), the Genebanks CRP was regularly discussed. The Evaluation Team noted that the Crop Trust communicated directly with the Fund Council on two occasions on behalf of the Genebanks CRP, raising awareness among donors of CRP activities and accomplishments. However, similarly with the Consortium Board meetings, discussions focused mainly on financial matters and on the current and future funding of the Program. The financial stability of the CRP, and the need for guaranteed funding, was endorsed both by the Consortium Board and the Fund Council. Furthermore, Fund Council members regularly highlighted the "vital importance of the genebanks" and "recommitted, in both the short- and long-term to make it a priority to secure funding for them in line with existing agreement on the partnership nature of support to the genebanks"¹¹.

At the Fund Council's 13th meeting, the Crop Trust and Consortium Office gave an in-depth presentation on the technical work of the genebanks and financial options for secure and sustainable funding, and the meeting minutes reveal active discussion and participation by Council members. At its 14th meeting in November 2015, the Fund Council decided on a "blended approach" to financing the genebanks to reduce reliance on Window 1 funds. The Council agreed to a 3 percent levy on the Windows 2 and 3 and bilateral funding of relevant CRPs¹². In donor feed-back received by the Evaluation Team, implementing the levy was highlighted as an essential step forward. During the 2015-2016 transition to the new CGIAR System Organization, the matter remained on hold but in its 3rd meeting in November 2016, the new System Council decided to initiate a "wider funding discussion" amongst the System Council members in due course. The discussion as per the minutes "includes the Genebanks decision, builds on the work done on the transition, and does not seek to reinvent the wheel"¹³.

¹¹ See Fund Council meeting summary (FC13, April 2015):

<http://library.cgiar.org/bitstream/handle/10947/3942/FC13%20Summary%20FINAL.pdf?sequence=1>

¹² See Fund Council meeting summary (FC14, November 2015):

¹³ Fund Council decision made at the 14th FC meeting in November 2015 that, inter alia, "a 3% levy would be applied to Window 2, 3 and bilateral funds, applicable only to the relevant CRPs and should be included as a line item in CRP budgets. Actions related to this decision will be initiated in 2016."

2.1.3. Centers' governance and management roles

Prior to CGIAR reform and implementation of the CRPs, the individual genebanks were independently managed and funded by each Center. None of the governance and management arrangements for the Genebanks CRP relieves the Centers of their primary responsibility for the safety, sustainability and effective management of the individual genebanks in their care. The stewardship responsibility of Center Boards for these collections exists in perpetuity and does not ebb or flow with the availability of funding. While the Evaluation Team did not assess Center Boards' governance performance, it sought to understand the ways in which the CRP was influencing the Boards' responsibilities, and extent and nature of activity at Center senior management and Board levels.

To meet their responsibility, Center Boards rely on Center management to oversee the following for relevance and timeliness and to frame issues and reports for Board review, when necessary:

- foresight and planning, particularly for long-term sustainability and financial stability of the Centers' genebanks;
- risk management; and
- understanding and helping to shape the CGIAR strategy, goals and priorities for genebanks (annual reporting, representation in System-level advisory/governance roles).

Feedback to the Evaluation Team from Center senior managers indicated that issues related to the management and governance of the genebanks (and the CRP) are usually handled at Center senior management level, and would only be elevated to the Board on occasion. The Genebanks CRP's Quality Management System (QMS, discussed under section 3.1.1) has actually enhanced the genebank-related risk management and oversight, because the QMS includes a risk management register. It appears that Center Boards in most cases do not receive regular briefings about the status of their genebanks, the progress of the CRP or the status of long-term plans for funding the genebanks. However, considering the additional investments by Centers on genebank facilities and feedback from genebank staff, the Evaluation Team concludes that the funding security and sustainability brought about by the Genebanks CRP influenced Center managements (and oversight) by making them more confident to take decisions outside the CRP's funding remit, CIAT's plans concerning a biodiversity facility being an example (see also Chapter 3).

The area that seemed to be least addressed at Center leadership and Board levels was engagement in CGIAR strategy, goals and priorities for genebanks, where, in the Evaluation Team's view, the Centers' involvement would be invaluable. Better coordinated participation and advocacy for genebanks at the Center level and feedback to System-level should enhance the reputation and value of the CGIAR in-trust collections at the global level, and assure effective representation on policy matters. The Evaluation Team did not find that such coordination had taken place.

2.1.4. Overall conclusions on governance

The Evaluation Team reached three main conclusions. First, the CGIAR Consortium—especially the level of the Consortium Office leadership but also the Consortium Board - was derelict in its agreed responsibilities and failed to provide leadership on governance for the Genebanks CRP. Second, by not exercising a leadership role at the System-level on behalf of the CGIAR's genebanks, the Consortium

failed to represent their interests and advance the reputation and visibility of one of the CGIAR's most important assets. Third, while there were deficiencies at the level of the Consortium Board and leadership, as well as the Crop Trust Executive Board, interactions between the Crop Trust on behalf of the CRP and the Fund Council permitted the latter to provide a degree of oversight with regard to funding, its allocation and use.

Recommendation 1. The System Organization should contribute to the effective governance and management of the Genebank Platform, by consistently representing CGIAR on the Crop Trust Executive Board and the Genebank Platform Management Team.

Recommendation 2. The Crop Trust Executive Board should execute a clearly defined role practicing its responsibilities in the oversight and governance of the Genebank Platform, distinguishing this role from its governing role for the Crop Trust, particularly with regard to Platform funding, its allocation, and use, and it should report the status regularly to CGIAR.

2.2 Management

In this section the Evaluation Team presents its analysis and findings of the Genebanks CRP management and Management Team, management operations (including financial management), reporting and communications. Key sources for assessing management included: interviews with the Crop Trust staff involved in Genebanks CRP management and other Management Team members, Center genebank managers and Consortium Office staff; meeting minutes of the Management Team and AGMs; Annual Reports, reporting on the Online Reporting Tool (ORT) and the 2016 Audit report; site visits and attendance at the 2016 AGM.

2.3.1. Day-to-day management

The day-to-day management and technical support of the Genebanks CRP involves some 14 staff at the Crop Trust (as per record of 2015). This includes the CRP Coordinator (almost full time at 90 percent), CRP Manager (formerly the Crop Trust Deputy Executive Director, who has had a less time-consuming and visible role than the CRP Coordinator), three full time staff - Technical Assistant, QMS Manager and Information Systems Manager - and other staff with 10 percent-70 percent of their time allocated to the Genebanks CRP matters, resulting in 7.1 FTE for the Program in total. The Evaluation Team does not consider this over-sized, considering that the CRP covers 11 centers. The Evaluation Team looked at technical, strategic and financial management; development and use of management tools; and interaction with the genebanks. These the Evaluation Team considers under "management" conducted by the Genebanks CRP leadership in the Crop Trust.

In its interactions with the Center genebank staff during site visits and in interviews, the Evaluation Team received favorable feed-back about the management of the CRP. Interviewees consistently stated that technical management has steadily improved throughout the program's lifetime and the satisfaction of genebank staff with the CRP management is high in many respects. Financial management in particular was appreciated by those providing feed-back to the Team.

The technical issues are complex, given the wide range of crops in the genebanks, and effective management has required developing a high level of crop understanding. This has led to what the Evaluation Team considers currently to be constructively helpful interactions between the CRP Coordinator and individual genebanks. There are examples when CRP management has addressed emerging issues through rapid and timely action, such as assisting the ICARDA genebank to re-establish its operations in Morocco and Lebanon through repatriation of seeds from the Svalbard Global Seed Vault (SGSV). The Team views this as very much a product of the CRP, given the lead taken by the Crop Trust and CRP management, and regards it of global significance. Additional examples of the positive views expressed about CRP management included a high level of satisfaction with the ORT, the development and promotion of QMS, the external genebank reviews and subsequent Recommendation Action Plans (RAPs), and the high standards of the accounting procedures that have been developed. All these are discussed in more detail below.

The Evaluation Team also perceived overall satisfaction with CRP management residing in the Crop Trust. This was reflected in the positive feedback about the relationships between the Crop Trust and the genebanks, and the continued arrangement in the Platform. The Team's favorable assessment of the Genebanks CRP performance presented in Chapter 3 also speaks to positive performance of the CRP management.

2.3.2. Management Team

The Genebank CRP management operates in consultation with the Management Team, bringing matters for decision to the Management Team meetings, held every two to three months through virtual conferencing. Meetings have been chaired by the CRP Manager who otherwise did not have the same hands-on role in management as the CRP Coordinator. The composition of the Management Team has changed over the lifetime of the CRP. Initially, the Management Team in the early meetings (2012) did not include representation by the genebank managers. This practice followed the CRP proposal that presented the Management Team as independent from the genebanks but including the Consortium Office to represent the perspectives and decisions of the Consortium Board. However, this was changed in the 2013 meetings and since then three representatives of the genebanks managers have been full members of the Management Team. These three are the Executive Members of the Article 15 Group of genebank managers (A15G) that replaced the Inter-Center Working Group on Genetic Resources¹⁴ that before the Reform has served a broad coordination role. Periodically Management Team meetings were open to all Genebank Managers.

The Evaluation Team considers that broadening the membership of the Management Team to include genebank managers strengthened the Team by engaging an essential stakeholder group in a regular fashion in discussions that covered a broad range of matters, for example on technical, resource, communications and financial areas (see below). It also secured a balance of interests between the genebanks and the Crop Trust, and helped to address concerns about the dual role of the Crop Trust. The regular and active participation of the Consortium Office would have been valuable for the same

¹⁴ The Inter-center Working Group on Genetic Resources was created to address on a System-wide level the needs for common policies and activities for genetic resources collections. Meetings were attended also by representative of FAO and most recently, before the group closed in 2010, by the Crop Trust, the International Treaty Secretariat and Governing Body

reason. However, the Consortium Office's presence was sporadic. It participated in only 50 percent of the meetings and not at all in 2015.

The Evaluation Team found several aspects of the role and functioning of the Management Team unclear. The Terms of Reference for the CRP Management Team are not spelled out, with only a few bullet points provided in the original CRP proposal as to the roles and responsibilities. Judging by the minutes of early meetings, there was no clearly defined and consistent membership of the Management Team; the lists of those present made it difficult to determine precisely what the composition was at any one time. Overall, the Evaluation Team found that the Management Team minutes were not comprehensive and informative concerning decision-making and follow up.

As would be expected, a large range of technical and logistical issues and updates were discussed at different times. The Management Team received updates on CRP activities such as QMS, the seed longevity study, Genesys and GRIN-Global, Divseek¹⁵, and Crop Advisory Groups (to provide advice on cross-center genebank issues for the same crops, such as maize for example). The Management Team agenda also included the timing, venues, agenda and summaries of the AGM. A15G 'updates' or 'feedback' were regularly included as agenda items, but sometimes with nothing reported. In addition, during the meetings where Consortium Office was present, the meeting included a separate "Updates from Consortium Office". The Evaluation Team found that the meetings focused mainly on updates and logistics, with little content on clearly strategic issues except more recently when the Management Team became more involved in the development of the Genebank Platform proposal. While financial matters and updates were provided at the Management Team meetings, the Management Team did not have a clear role in this area. On basis of Management Team meeting minutes and interview information, it seems that the genebank managers represented at the CRP Management Team were not involved in any strategic decisions on fund allocation. Given that 80 percent of the funding was allocated on the basis of the Costing Study, the Evaluation Team did not expect major discussions on these allocations. The remaining budget, however would have warranted some discussion by the Management Team. However, feedback indicated that the representatives of the A15G were uncomfortable making decisions that would impact on other genebanks. Concerning the functioning of the Management Team overall, interviews with genebank managers revealed some concern that only the voices of the three A15G representatives in the Management Team were taken into account, leaving the remaining A15G members often feeling that they are not entirely in touch with Management Team decisions.

The relation of the A15G to the CRP Management Team and its overall function was not clear to the Evaluation Team. With representation of the genebank managers in the Management Team from 2013 onwards, it remained unclear to the Team what precise purpose the A15G serves. The A15G has held its own meetings in conjunction with the AGM. The Evaluation Team observed during the 2016 AGM that the A15G 'meeting' was very informal, seemingly *ad hoc* and without minutes, suggesting that its existence may have little utility or clear justification. With the CRP and its coordination mechanisms in place, a role similar to that previously played by the Inter-Center Working Group on Genetic Resources would seem to some extent duplicative. If the A15G serves as a forum for genebank expert opinion, then it would need to effectively feed into the Management Team meetings, but this was not obvious.

¹⁵ <http://www.divseek.org/>

The Evaluation Team thinks that the A15G could potentially compensate for the lack of substantive and strategic decision making by the Management Team and as a way to represent the voice of all genebanks managers.

2.3.3. Annual Genebank Managers meetings (AGM)

The AGMs have been an important forum for all genebanks managers, CRP management and other Crop Trust staff to review the past year's activities, progress and achievements, and to make plans for the next year. It is also an opportunity for the CRP Coordinator to meet with genebank managers individually to discuss center-specific issues. The Consortium Office has been represented in all AGM meeting except twice when they participated virtually. National scientists have also been invited to AGMs and the venue for each meeting has been chosen in a different region of the world to facilitate this. From its attendance at the 2016 AGM and review of the available AGM minutes, the Evaluation Team concludes that the AGMs have been extremely valuable for managing and coordinating technical developments in the CRP, and have been an important mechanism for enhancing synergy and harmonizing activities amongst the genebanks. They have facilitated an increased understanding of problems and issues experienced by individual genebanks and have led to a range of efficiency gains (discussed in detail in Chapter 3), not least through input from invited international technical and scientific experts (participation of the forages expert Bruce Pengelly at the 2016 AGM is a good example). A valuable opportunity has been taken in capacity building, which has been enhanced by including local and national scientists in the meetings. Issues discussed and agreed at AGMs appear to have been taken forward to the CRP Management Team meetings for further discussion and action, but due to deficiencies in Management Team minutes, the Evaluation Team could not judge how consistent the follow-up has been.

2.3.4. External Reviews

One of the positive aspects of the CRP management identified by the Evaluation Team were the external reviews organized by the Genebanks CRP to assess genebank operations and recommend measures to overcome any bottlenecks.

Individual genebank reviews, commissioned by the Crop Trust, were carried out with the aim of assessing the efficiency and effectiveness of each genebank's operations and finances, and the status of the genebank within the context of the global system for the conservation and use of genetic diversity. These reviews were carried out at different times: ILRI and IRRI in 2012; Bioversity International, CIAT and CIMMYT in 2013; Africa Rice, ICRISAT, and IITA in 2014; and CIP and ICRAF in 2015. A "light" review of ICARDA has been completed only recently due to re-establishment of the genebank in Morocco and Lebanon. As part of the external review, the Crop Trust undertook a financial audit of genebanks. In some of the external review reports, the findings of the financial audits were also included.

The external technical reviews have been extremely useful, because they have come up with recommendations for each genebank, identifying the specific and critical issues that needed to be addressed. RAPs were developed to address bottlenecks, and funds were allocated for implementation according to individual, prioritized needs. Furthermore, some of the recommended actions which were

common to several genebanks, such as developing succession plans or improving the financial transparency, have been implemented at the CRP level through the QMS (see section 3.2) and the ORT, and common approaches to assess seed longevity, for example. Other issues, like collection gaps, will be tackled under the Genebank Platform as discussed during one of the sessions at the AGM in 2016.

The Evaluation Team found the external review process a relevant management tool to guide RAPs as well as fund allocations according to review recommendations and individual genebank needs. Some issues identified in the review as important to be addressed are still pending, such as the information sharing of accession phenotyping between breeders and genebanks. Overall these reviews have helped to consolidate and, in some cases, implement state of the art conservation. Examples include conservation techniques such as cryobanking in CIP, seed sorting at IRRI, and work flow tracking with bar-coding in several genebanks. Given the wide range of crops and issues specific to each of the 11 genebanks, the Evaluation Team suggests that the Genebank Platform continue commissioning periodic reviews as an appropriate management tool to monitor genebank operational progress and identify any additional bottlenecks for enhancing overall genebank performance. As these reports contain a wealth of information and represent a mechanism for accountability, the Evaluation Team considers that it would have been useful to publicize the findings of the reports in other reporting and make the reports themselves available online. In the future this should be done.

The reviews raised some aspects that the Evaluation Team considers very important for CGIAR in the future, particularly what research is critical for efficient conservation and long term cost savings. In this respect, the Evaluation Team was pleased to note the inclusion of research for conservation in the Genebank Platform.

2.3.5. Financial management

Financial management and accountability of the Genebanks CRP has been one of the main responsibilities of the Crop Trust. This covered areas of accounting, reporting, and disbursements between the Crop Trust and the individual Centers carried out through the ORT. Many Center finance staff stated satisfaction with Crop Trust financial management, and described the financial management as well organized and efficient with noted improvement over the years. The Crop Trust Finance and Administration Committee (FAC), that has both financial and technical expertise, has worked to develop a common framework for financial reporting, through the ORT, and have provided timely feedback once Center financial reports were submitted. Financial reporting requirements by the Crop Trust were stated as being very detailed. This has led to better management and to improved internal oversight of planning, costs, and spending across the Genebanks. Indeed, several Center financial managers stated that the Crop Trust's financial management is a model for other CRPs to follow.

In addition to the annual financial reporting, the Crop Trust finance team has worked with Centers and with the CGIAR Consortium towards harmonization, common understanding and implementation of financial guidelines across CGIAR Centers, especially in terms of overhead and full cost recovery. The Crop Trust also conducts a financial review of the individual genebanks alongside the independent technical review, and has carried out these financial reviews for each of the 11 genebanks. The Crop Trust financial team members presented the findings from the financial reviews directly to the Center

senior finance team. These mechanisms have allowed for direct oversight over the management and use of the funds allocated to the genebanks.

2.3.6. Fund allocation

The Genebanks CRP was established to guarantee sustainable funding for routine genebanks operations, not for research, and oversight and cost-efficient management of the funding was given to an independent organization, the Crop Trust. The scope of routine activities and their estimated costs were set in the 2011 Costing Study¹⁶ commissioned by the Consortium of CGIAR and the Crop Trust. While previously each Center has done its own estimates of its genebank costs on basis of variable criteria, the Study was necessary to provide accurate cost estimates for routine operations on conservation of the entire range of crops across CGIAR genebanks - from acquisition to distribution - on comparable basis, to the extent possible. The Study covered costs for personnel, operations, capital and indirect costs. It involved collecting and reviewing specific genebank cost information systematically from 10 CGIAR Centers¹⁷. The data were then entered into a financial model to provide information on the costs of individual genebank operations as well as to generate reports on the overall cost of operating a genebank in a given year. The funding of routine operations as per the Costing Study has been consistently about 76 percent of total expenditure in the five years of the CRP.

The Costing Study was conducted at the time CGIAR was transitioning from a focus on funding activities through individual Centers to funding activities through the CRPs. Because the Costing Study relied on the introduction of full cost accounting at Center level, the shift to funding programs through CRPs has had an impact on Center genebank budgets vis-à-vis the initial costings. An important financial objective of the Reform was to restore unrestricted funding (from the low levels it had reached in the preceding period), in the form of Windows 1 and 2 funding, as major source of funding. Thus, greater attention than previously was paid in enforcing full cost recovery on bilateral project funding. This mandatory requirement resulted in Centers across CGIAR applying full cost recovery also to the budgets of genebank operations for various services provided by the center, such as library for example, and other costs that are integral to running a center.

There were consequences. First, the concept and criteria of full cost recovery were not applied consistently across Centers, potentially reducing the level of funds in some Centers below the agreed genebank operating budget. Therefore the Crop Trust Finance and Administration Committee was reluctant to approve adjustments in Center budgets to accommodate the cost recovery that were not directly attributable to routine genebank operations. Despite considerable inputs from and negotiation with the Crop Trust, the interpretation and application of full cost accounting has not yet been resolved. However, a taskforce of Corporate Service Executives at Centers is currently working on the harmonization of full cost recovery implementation across CGIAR.

Other financial issues with the Costing Study included insufficient consideration to changes in foreign exchange markets and inflation, and costing personnel promotions. Volatility of foreign exchange markets has, in some years, negatively affected genebank budgets in some Centers (and Center budgets overall) since most expenditures are in local currency yet budgets are built in US dollars. The

¹⁶ The Cost to the CGIAR Centers of Maintaining and Distributing Germplasm ()

¹⁷ Estimation for conservation at World Agroforestry Center was done separately.

issue of capital investment is particularly complex, but was addressed in the Costing Study to calculate annual costs of maintaining Center collections. Nevertheless each Center prioritizes what capital investments it can afford or for which additional funding is needed.

The shortcomings of the Costing Study were apparent, and the Study highlighted the problems associated with determining what are relevant and appropriate costs across different genebanks to claim. In early 2015, the Crop Trust initiated a Parity Study (undertaken by an external expert) to address these problems. However some genebank managers expressed the view that the model and Study itself had flaws, and at genebank level it has not progressed. Efforts to address harmonization of full cost recovery in Centers would be a step towards addressing parity issues. Notwithstanding the difficulties in arriving at a consistent understanding of what it costs to run a genebank (and accepting that costs will differ from genebank to genebank because of location-specific costs, and, more importantly, the nature of the germplasm conserved), the Evaluation Team does consider that efforts must continue to arrive at a better analysis of costs. Continued guaranteed donor support for the genebanks might be at jeopardy unless this issue is resolved.

Recommendation 3. Given the shortcomings in the original Costing Study, and despite difficulties encountered earlier, the Genebank Platform management should give high priority to revisiting the Parity Study to establish realistic and transparent budget for each Center genebank.

Fund allocations for other purposes than routine operations accounted for about 23 percent of total funding consistently across the years (Table 2, Chapter 1). The Genebanks CRP has provided funding for some capital requirements, including re-establishing the ICARDA genebank outside Syria in Morocco and Lebanon¹⁸, new cold storage rooms for Africa Rice in Côte d'Ivoire, an automated seed sorter/cleaner for IRRI for reducing personnel costs, and the liquid nitrogen generators at CIP. Such generators are also planned for ILRI, although not with CRP funds. Justification for most of these investments has been that they will start generating savings once the implementation and capacity building related to these have been completed. Investments on big infrastructure were generally not funded from the CRP budget, with the few exceptions mentioned above. Nevertheless, the Evaluation Team noted that two Centers (IRRI and ILRI) have financed and completed significant infrastructure improvements for their genebanks during the CRP, without funding from the CRP. CIAT has constructed new greenhouses with German bilateral support, and there are ambitious plans to build a new biodiversity facility. The Evaluation Team considers that these few examples of Centers investing on genebank infrastructure outside the Genebanks CRP funding are an indication of higher profile of the genebank in each Center.

As early as the second Management Team meeting in April 2012 it was already recognized that depreciation policies vary from Center to Center. Although it was agreed that this topic should be considered further, the issue still needs to be addressed. Notwithstanding, the Evaluation Team found it commendable that through the CRP, purchase of selected capital items has been possible to improve genebank operations.

¹⁸ As per the ICARDA Investment plan approved by the Consortium Board in November 2013 meeting and endorsed by the Fund Council in May 2016.

Among activities and items over and above the routine operations, the Management Team also gave attention to funding activities that enhance cost-efficiency in areas related to basic conservation that are common to several or all genebanks; seed longevity is such an example (see Box 1 for more details). This was to address the situation that genebanks were not all at the same stage in some areas of basic conservation, and shared expertise could help centers upgrade their capacities. Early on funds were also allocated for the prioritized RAPs, which were derived from the individual genebank reviews. The allocation of funds for RAPs resulted from negotiation between the CRP management and individual genebank managers, on basis of the specific review. In the RAPs, funding was allocated to address constraints or deficiencies that although not eligible for routine CRP funding nevertheless had to be resolved. The fact that the different genebank reviews conducted at different times as well as the one-to-one negotiations, rather than open discussions or formal approval at the Management Team meetings, contributed to a perceived lack of transparency in fund allocation decisions reported to the Evaluation Team, and which the Team also observed at the 2016 AGM. In 2014 and 2015 (see Table 1), carry-over funds from 2012 (USD 5.7 million) and 2013 (USD 3.3 million) were used to finance the RAPs, data management, and QMS work. While these three initiatives have indeed been essential and key to the success of the CRP and upgrading of the genebanks, the process for allocating funds and approval of these initiatives did not appear sufficiently formal and transparent to the Evaluation Team.

Recommendation 4. The Genebank Platform management should subject all fund allocation proposals for approval by the Management Team, and ensure that all decisions on fund allocation are recorded in Management Team meeting minutes and available to Centers and genebank managers in order to maintain a high level of trust and transparency.

2.3.7. Financial stability

In April 2011, the CGIAR Fund Council concluded that '*... ad hoc* funding is not a responsible way to fund genebanks. Hence, it is critical for CGIAR to find a way to have long term surety and a sufficient endowment for this important material for mankind.' In the Genebanks CRP proposal, the Crop Trust considered that, on basis of the Costing study, an endowment of USD 525 million would suffice to meet all core recurring genebank expenses for Article 15 collections in perpetuity associated with conservation, multiplication and distribution by 2017. The Genebanks CRP five-year work program contemplated therefore the transition to sustainable funding by the Crop Trust raising USD 525 million as their endowment target, of which they had USD 120 million in hand in 2011. The transition to secure and sustainable funding was considered an integral part and major output of the CRP.

While the Crop Trust contribution to Genebanks CRP budget was supposed to increase from USD 2.6 million in 2012 up to USD 3.8 million in 2016, the actual contribution from the endowment has increased at a slower rate, raising concerns about the Crop Trust's ability to provide the agreed sustainable financing of the CGIAR genebanks.

At the end of the Genebanks CRP the endowment had only USD 188 million, which is a small increase of USD 68 million over the past five years. The Evaluation Team recognizes that the five-year time frame covered by the Genebanks CRP proposal was an unrealistic period within which to raise a sum sufficient for the completion of the endowment. This goal was perhaps never appropriate or

achievable, taking into account the political environment when the Genebanks CRP was launched. The transition period will definitely take much longer than originally forecast.

2.3 Reporting and Communications

The Evaluation Team assessed financial and programmatic reporting considering whether the level and adequacy of reporting on the annual achievements of the program were commensurate with a financial investment of about USD 24 million per year, over five years. The Team also considered the extent to which reporting and communication has increased awareness of the Genebanks CRP, raised the profile of CGIAR internationally and enhanced its reputation as a steward of these important germplasm collections.

2.4.1. *Reporting from genebanks to the CRP Management in the Crop Trust*

Each year, Centers submit to the Crop Trust (as Program Manager) detailed information, including a technical report, about genebank activities in accordance with annual work plans. This information is used to monitor progress towards achieving targets against a set of performance indicators, the precise number of which has varied to some extent. The Evaluation Team appreciates that some adjustment of the performance indicators was necessary as their utility was evaluated. The Crop Trust developed the ORT to collect and collate reports from Centers on technical progress and financial expenditures. Feedback from Centers to the Evaluation Team was broadly favorable about the ORT, particularly with regard to financial reporting and accountability. The CRP Coordinator (and Crop Trust Finance and Administration Committee) has been assiduous in assessing the reports from Centers, following-up where there were points to be clarified, and providing feedback as necessary.

In interviews, some Center staff (both genebank and financial) considered that the detail requested and subsequent follow-up could be excessive at times. While the Evaluation Team strongly endorses the development and use of the ORT, the level of detail requested of genebank managers with more than one crop collection (cf. ICRISAT with IRRI, for example) has been described by some genebank managers as excessive, because the same high level of detail in information requested is reported for each crop collection separately. The Evaluation Team suggests that the Genebank Platform management in the future carefully assess whether this reporting load for genebanks with multiple crops could be reduced.

2.4.2. *Reporting to the Consortium*

As with all CRPs, the Genebanks CRP has submitted Annual Reports to the Consortium, which compiles a CGIAR Research Portfolio Report for the Fund Council, and this latter report is made available to the public. The Portfolio Reports included information on the Genebanks CRP mainly through an annex, which provided a narrative section on annual technical achievements by the Program and selected specific indicators to highlight progress. The Evaluation Team reviewed the Annual Reports for 2012-2015, and summaries prepared for the CGIAR Portfolio reports.¹⁹

¹⁹ The Team noted that CRP Management submitted different versions of annual reports, and summaries of the annual reports, to the Consortium. In July 2016, new updated versions for both 2014 and 2015 annual reports were submitted and

The Team recognized that reports were a synthesis about what the genebanks had achieved compared to the level of detail submitted by the genebanks via the ORT. Given that the Genebank CRP was a research support program and template used by other CRPs did not suit this program, these issues were discussed with the Consortium Office in early 2013, with an initial understanding on how to address the specific needs of the program. While testimony to the Evaluation Team from the Consortium Office indicates there was dissatisfaction with the Annual Reports, there was no specific feedback to the CRP Management until 2016, possibly triggered by the Audit Report that also found deficiencies in annual reports. Feedback on the 2015 report reflected strong disapproval by the Consortium Office and resulted in a thorough revision of not only the 2015 report, but also the 2014 report that satisfied the Consortium Office. There seems to have been a misunderstanding between both entities about the content and format of the annual reports, evident from correspondence and interviews, which strained the relationship between the Genebank CRP Management and the Consortium Office.

The Evaluation Team found that the annual reports did not easily facilitate the Team's need for information on the program achievements and progress over the years. This was partly because the template largely followed the format of other CRPs with sections on impact pathways and outcomes, and partly because there were changes in reporting on indicators over the years (see Annex 6). The section on achievement which would have allowed elaborating on progress in genebanks and developments in the program, were found to have limited information. The Genebanks CRP report contained as part of the CGIAR portfolio reports were informative, but by default were brief, focusing on program highlights. Thus the Evaluation Team was unable to determine what progress the CRP had made against the original program objectives that were spelled out in the approved CRP proposal. To address this, the Evaluation Team requested from the CRP management an achievements matrix against program objectives (see Annex 4).

The Genebanks CRP proposal included a table of performance indicators (Table 5 in the proposal), which was based on those designed by the Crop Trust in managing their long-term grants prior to the establishment of the CRP. Discussions on revising the targets and indicators was taken forward by the Crop Trust with genebank managers to report on tailor-made indicators (initially 18 and later reduced and modified). Thirteen indicators were reported regularly throughout 2012-2015, in the CGIAR portfolio reports six key indicators were reported on in the last. For the Team's assessment, the reporting on indicators was not useful, because they were not very informative at an aggregate level.

In terms of financial reporting, the Evaluation Team found that while financial reporting from genebanks to CRP Management has been closely managed and the reports provide detailed information, the same cannot be said for financial reporting to the Consortium Office, where all CRPs were required to submit L series²⁰ financial tables. These tables did not cater for providing the detail which would have been helpful, for assessing expenditure as per the CRP proposal. Financial information on main activity areas of the CRP (routine operations, upgrading, meetings,

approved by the Consortium Office. In later reports, values for indicators in earlier reports were in many cases retroactively adjusted. The CGIAR website, to date, has different versions of the annual reports, with only 2012 and 2013 being complete, 2014 only a brief narrative summary, and 2015 not available.

²⁰ L Series Reports are financial reporting as defined in the CGIAR Accounting Policies and Reporting Practices Manual, 2004.

management.), and on costs for implementing recommendations from the reviews (RAPs) should be reported on annually (as also observed in the 2016 Audit report).

In agreement with many of the recommendations of the 2016 Audit report, the Evaluation Team considers that it should have been possible for the Consortium Office and the Genebanks CRP management to mutually agree the format and content of Annual Reports through dialogue early on. Consequently, this would have been the right opportunity to develop an informative report on activities and progress of the CRP that could feed into external communications.

Overall, the Annual Reports, as judged by the Evaluation Team, could have been written to present a more adequate account of program progress in terms of the objectives. In terms of wider dissemination of the information, the Team accepts that these reports were not intended as such to provide a window for the world about the Genebanks CRP, its players and their roles, and the important work carried out in the CGIAR genebanks. However, no alternative reporting or communication was available for external stakeholders either (see 2.4.3), apart from the summaries in the annual CGIAR Portfolio report which was, as stated earlier, the only publicly available report about the CRP. Therefore the Team considers that, as it was necessary to adapt the Annual Report to the character and purpose of the Genebanks CRP, the opportunity could have been used to present progress and achievements across the genebanks in a more systematic and comprehensive manner.

2.4.3. External reporting

Representation of the Genebanks CRP and CGIAR in external fora concerning genetic resources activities was criticized by a number of persons interviewed by the Evaluation Team. CGIAR is perceived as having had minimal representation at the FAO Commission and the International Treaty unlike in the past under the SGRP. In its mandate, the Genebanks CRP did not include representation at international policy fora. With the closure of SGRP which had prepared (with its host Bioversity International) CGIAR contributions for FAO meetings and represented the Center genebanks in FAO and other international events, this role was not filled.

CGIAR did communicate with international bodies at varying levels (including submitting written reports to the FAO Commission). Nevertheless, it seems that an opportunity was missed to further demonstrate how CGIAR, as a System and through the Genebanks CRP, was meeting its international obligations, and also to bring its collective experience and expertise to bear in these international fora. Given the CRP's mandate (which did not include representation of the CGIAR in international policy fora), the Evaluation Team could not establish whether there had been an agreement on how, and at which level or by whom CGIAR should be represented particularly at FAO meetings.

The Evaluation Team concludes that overall reporting has not been at a level the Team would have expected from a program as important and as well financed as the Genebanks CRP, being a unique cross-CGIAR Program of a considerable size. Furthermore, CGIAR's reputation was not well served by uncertainty about representation of CGIAR at international events, such as the FAO Commission.

The Evaluation Team also considers that, as part of regular reporting, the minutes of the Genebanks CRP Management Team meetings and the AGM in particular should have been made public, as well as

the external reviews and the decisions that followed (RAPs). This would have increased transparency on how and where funds were allocated.

Recommendation 5. Given that the Genebank Platform is not a research program and that its mandate and aims are different from those of the CRPs, tailor-made reporting format needs to be agreed for the Platform. Therefore the Genebank Platform management and the CGIAR System Management Office should, at the earliest opportunity, agree on bespoke reporting needs and format to serve CGIAR and the wider genetic resources community better.

2.4 Communications

The launch and implementation of the Genebanks CRP was an important milestone for CGIAR considering the Centers' mandate to conserve and use plant genetic resources for food and agriculture. For the first time the CGIAR donor community not only recognized the fundamental importance of the Center genebank collections for conserving genetic diversity, and making it available for plant breeding for the benefit of humanity, and were now prepared to allocate protected and guaranteed funding. This reflected donor recognition that the genebanks and their collections are some of the most important assets of CGIAR. It enabled consistent planning for Center genebank operations without the funding cuts that affected other CRPs. This funding stability had an impressive effect over the past five years: Centers have upgraded facilities and operations, and germplasm in their collections is probably more secure and available today than it has been in the past, as the Evaluation Team's assessment of the technical performance in Chapter 3 shows.

Given the totality of the information about the CRP (that resides with the CRP Management in the Crop Trust), the Evaluation Team considers that communications, in addition to reporting, should have been among the important responsibilities of the CRP Management. Further, much has been achieved by the Genebanks CRP through the contributions of the individual genebanks (as documented in the Achievements Matrix, see Annex 4) and confirmed by the Evaluation Team. The management tools and internal reporting from the genebanks generated information that deserved to be communicated to a wider audience. With the exception of the comprehensive presentations to the Fund Council mentioned above, the Annual Report with insufficient content and very limited audience seems to have been the only reporting or communication explicitly on the Genebanks CRP. Crop Trust communications *per se* focused on fund-raising efforts for the endowment, its major contribution to the CRP. Nevertheless, this does not negate the need for specific communications, often technical, about the CRP and what it has achieved.

In several interviews the Evaluation Team perceived that the profile and visibility of CGIAR's role in plant genetic resources conservation internationally was less prominent today than before the CRP came into being, and when the former SGRP provided collective visibility to the CGIAR genebanks.

The CRP has not had any coordinated communications strategy for the program as a CGIAR CRP. The CRP has no social media presence, unlike the Crop Trust that visibly promotes, for example, the Crop Wild Relatives Project and the global significance of SGSV that has had ample press coverage in international media and through the Crop Trust's website. The Evaluation Team was not aware of any stories in the media promoting or highlighting the work of the Genebanks CRP as a CGIAR program, its

vital work on genetic conservation, and its relationship with the SGSV. Individual Center genebanks have been the focus of some Crop Trust communications, and stories like the ICARDA genebank re-establishment were widely disseminated. Considering the special case of the SGSV, its wide promotion in worldwide press releases, though vitally important, seldom recognized the fact that much of the germplasm conserved there has so far come from decades of CGIAR efforts in plant genetic resources conservation. As another example, Genesys and GRIN-Global received high visibility on social media, with little or no reference to the developments resulting from the Genebanks CRP.

The Crop Trust website (under 'Global Genebank Partnership') contains insufficient information on the Genebanks CRPs. Indeed it is not easy to locate CRP-specific information²¹. What little is there is somewhat misleading as it focuses on the Crop Trust long-term grants. Specific web pages for the Genebanks CRP could have provided transparency about its technical and financial aspects, access to documents of interest such as the external review reports (that according to the AGM would be made available online) as well as highlighting how CGIAR was meeting its obligations under the International Treaty. A dedicated, well maintained website is perhaps one of the most fundamental communications tools. All other CRPs use a Program website for reporting and communication, and for creating a Program identity different from that of the Lead Center. Through a dedicated web site, it would have been possible to easily make information available more effectively to a wider constituency, such as the FAO Commission, the Governing Body of the International Treaty, donors, and the general public. The concerns that several stakeholders expressed to the Evaluation Team about the current status of conservation and use of genetic resources by the CGIAR Centers may have resulted from lack of visibility of CGIAR's activities concerning genetic resources.

In the Evaluation Team's view, the Genebanks CRP management should have, from the outset, developed a communications strategy for the CRP independent of the Crop Trust, which would have further raised the profile of CGIAR genebanks as part of a system. A communications strategy and better branding of the Genebanks CRP as a CGIAR Program was also needed for recognition that most of the funding has come - and is still coming - from CGIAR. The Genebanks CRP is not a Crop Trust program *per se*, and there is confusion among many stakeholders—even among genebank managers and Crop Trust staff in this respect. The Evaluation Team noted a common misconception that the CRP is actually funded in its entirety by the Crop Trust.

This lack of promoting the CRP or giving it a greater visibility as a CGIAR Program has not served the CRP well, nor CGIAR more widely. The Evaluation Team received some feedback that this was done in order to draw more attention to the Crop Trust's own activities. The Evaluation Team does not agree with that perception. In communication, the Team sees that the interests of the CGIAR and those of the Crop Trust are fully aligned. However, given that the Crop Trust does have wide expertise in communications, and its own visibility has been widely and efficiently promoted, there should have been sufficient expertise and initiative in the Crop Trust to promote the Genebanks CRP, which is the Crop Trust's largest activity. Furthermore, the Team thinks that the CGIAR and the Crop Trust should have done joint communication, because highlighting the importance of the CGIAR's crop collections would have strengthened resource mobilization for the endowment.

²¹ <https://www.croptrust.org/our-work/supporting-crop-conservation/global-genebank-partnership/>

The Evaluation Team concludes that, notwithstanding the Crop Trust's reporting to the Fund Council, inadequate attention to report externally and to communicate CGIAR's role in genetic resources conservation and use, has led to opportunities lost in highlighting how guaranteed funding through Window 1 has enhanced the technical effectiveness and efficiency of the CGIAR genebanks. This has also meant an opportunity lost to highlight the special relationship between CGIAR and the Crop Trust, and how innovation to manage the Genebanks CRP through the Crop Trust has paid dividends (see assessment of efficiency and effectiveness in Chapter 3).

CGIAR branding for genetic resources needs to be addressed in the forthcoming Genebank Platform. The Evaluation Team noted that a website for the Genebank Platform is under development, and considers it long overdue.

Recommendation 6. The Crop Trust should incentivize and empower the Genebank Platform management to promote the Platform independently from the Crop Trust's own communications, in order to ensure that a comprehensive communications strategy is developed to promote the visibility and accountability of the Platform and the CGIAR genebanks. Furthermore, the Genebank Platform Management Team should use the communications strategy effectively for:

- promoting the work, progress and achievements of the Genebank Platform and its component modules;
- promoting cross-Center activities, details about germplasm exchange, and use of SMTAs;
- publishing minutes from the Genebank Platform meetings, including the AGM; and
- supporting recognition of the historic and current efforts of the CGIAR Centers as some of the main custodians of genetic resources worldwide.

2.5 Overall assessment of management

The Evaluation Team notes the high level of satisfaction among Centers with the management of the Genebanks CRP by the Crop Trust, particularly in terms of financial management support. The role and profile of the CRP Coordinator in the Crop Trust was enhanced during the life of the CRP, and the Evaluation Team concludes that the management has delivered good support to Center genebanks. The Evaluation Team considers that effective CRP Management has contributed to the CGIAR genetic resources being in a better situation now compared with the start of the CRP. The performance and achievement of the CRP in terms of increased efficiency and effectiveness of genebank operations are assessed in the following Chapter.

While the Evaluation Team recognizes that the role and composition of the Management Team is better defined in the Genebank Platform, it is equally important that clearly defined management principles identified by the Management Team are introduced and applied to ensure clarity and transparency of decision-making.

The AGM is the one venue that brings together all genebank managers, CRP Management from the Crop Trust, the Consortium Office and, equally important, external partners. The AGM is an effective review and planning forum that provides for participation by all attendees.

In the following three areas the Evaluation Team found scope for improvement, namely:

- differentiating CRP and Crop Trust roles in management;
- regular reporting; and
- communications.

The role of the Crop Trust staff working for the Genebanks CRP, particularly the CRP Coordinator, should have included the independent and active representation and promotion of the CRP more broadly in the media, making a clear distinction between the CRP and the activities and identity of the Crop Trust.

3 Efficiency and Effectiveness

In this Chapter, the Evaluation Team addresses the evaluation questions concerning efficiency and cost-effectiveness of the Genebanks CRP, and the extent to which the technical performance of the CGIAR genebanks has improved during the CRP's lifetime and as a consequence of the Program. In its assessment, the Team acknowledged the wide range and complexity of crops in the different collections that determines the biological context for conservation. Under efficiency, the Team considered the extent to which there is better harmonization and synergy among the genebanks, and whether cost savings have been achieved through collaboration and harmonization. Given that vegetative crops that cannot be conserved in the same way as seeds account for a large proportion of the conservation costs, the Evaluation Team paid particular attention to progress with these crops.

Field visits to selected genebanks and interviews with genebank staff provided a central part of the evidence for assessing efficiency and effectiveness. The Evaluation Team also had access to reports of the external reviews of all genebanks conducted in 2012-2015 and genebank action plans on the recommendations. The Team used the Achievements Matrix requested from the CRP Management as a reference document. Validating it against observations and other evidence was important for the Team's assessment of the Genebanks CRP performance in terms of enhancing effectiveness, synergy and genebank performance.

3.1. Synergy and harmonization

The Evaluation Team assessed efficiency by analyzing whether and how the Genebanks CRP had advanced synergy and harmonization among genebanks.

The Genebanks CRP has built on former collaborations between genebanks that existed before the CRP. Such collaborations, for example through the SGRP and the Inter-Center Working Group, were aimed at sharing information, funding prioritized upgrading of activities (for example through the Global Public Good projects 1 and 2) and collective reporting. In the Genebanks CRP the genebank managers, through their direct interaction with CRP Management and collectively, have had good opportunities to provide their expertise to achieve greater synergy and harmony across genebanks, leading to efficiency gains. The Evaluation Team found that the Genebanks CRP has promoted and encouraged such cross-Center collaboration in a way that had been more limited under the SGRP. The Evaluation Team identified a number of activities and initiatives that have enhanced synergy and harmonization, some of which are solely down to the existence of the CRP. These are discussed below. While the A15G has been in existence following the closure of the Inter-Center Working Group, it has not played an explicit role in enhancing collective action. Rather, that has resulted from interaction between the CRP Management and genebanks and mechanisms such as the AGM.

Center genebanks now routinely share common conservation approaches for the same (or similar) crops, exchange protocols, and even personnel on a short term basis, with one Center benefiting from expertise at another (e.g. CIP staff trained in GRIN-Global have helped ILRI in this respect). In the future, there is further potential for very close collaboration, as exemplified by the planning between

CIAT and ILRI to better integrate their forages collections, based on the findings of an external strategy for forages across CGIAR (mentioned in Chapter 2).

The Evaluation Team found that guaranteed funding has very likely underpinned this progress in synergy and harmony. The Team observed very strong willingness for genebanks to collaborate with each other to achieve efficiency gains. When prior to the Reform, individual genebank funding was vulnerable to reduction in core funding that was becoming more limited over time, genebank culture has clearly switched from survival to planning as a result of more secure funding. A good example of this is the inter-genebank forages strategy, mentioned above. Other examples of fruitful collaboration include paperless procedures developed at CIP for *in vitro* conservation and shared with other genebanks, including seed banks, and other collaboration in the *in vitro* operations (see section 3.3.1).

The Team recognizes that AGMs have been very useful to stimulate interactions amongst genebanks and to agree on common solutions to shared problems, clearly leading to harmonization, which is generated both top down, from CRP Management to genebanks, and bottom up.

3.2. Quality Management System

One of the most important shared activities leading to harmonization has been work focused on genebank standards underpinned by the quality management system (QMS) developed by the CRP.

Performance indicators developed by the Crop Trust for the long-term grants (LTGs) was the basis for initiating QMS efforts. In the early stages, the primary focus of QMS development was to facilitate continual improvement of genebank operations to conform with the 2014 FAO Genebank Standards. Therefore, implementation of the QMS emphasized capacity building. The Genebank QMS became an evidence-based, flexible framework that defined the elements to ensure compliance with regulatory policy, and outlined ways to achieve customized quality improvement.

The Genebank QMS offered three distinct advantages over other potential forms of quality management because it:

- utilized the 2014 FAO Genebank Standards as its primary guideline;
- was internally driven by genebank staff (as opposed to it being imposed by a third party like ISO, for example); and
- automatically encompassed all genebank processes (all crops and conservation forms).

In its first two-year phase, QMS was started in only nine of the 11 genebanks. It had the following five improvement goals:

- documenting procedures in a common format;
- training national staff and emphasizing the need for succession planning;
- identifying and mitigating risks;
- bar-coding all accessions in all procedures; and
- securing genebank facilities with access control systems.

CRP Management organized four Genebank Operations Advanced Learning (GOAL) workshops in 2015 and 2016 across Centers and crops as part of the capacity building efforts within QMS, to provide equivalence across Centers and to offer genebank personnel the opportunity to receive expert training

in key genebank topics. GOAL workshops have led to harmonization particularly because they include those actually working at the bench. They have also been important in terms of harmonizing data management in relation to Genesys and GRIN-Global (discussed in section 3.6). This is seen by the Evaluation Team as a very important focus of the GOAL workshops in the future.

A total of 101 genebank personnel from 11 CGIAR Centers were trained in QMS, bar-coding, the scope and obligations of the International Treaty, plant health, and several other topics. In addition to staff from CGIAR Centers, partners from national genebanks were invited to participate in GOAL workshops. To date, 31 partners from 22 national genebanks have received training in QMS, the use of templates and improvement plans. Further GOAL workshops will be organized as part of QMS planning under the Genebank Platform. The Evaluation Team considers the capacity building orientation of the QMS implementation very important. Extending the training to national genebank staff is highly commendable.

The Evaluation Team considers that the development and implementation of QMS as a key objective of the Genebank CRP has been a major success. Much of that success can be attributed to the QMS Coordinator, a Crop Trust consultant who, with great enthusiasm, took on the role to design and deliver QMS, one of the highest impact initiatives of the Genebanks CRP. Developing the QMS has required a clear understanding of the challenges for implementing a system that, as a result, has been so widely embraced. Furthermore, the success of the QMS in the genebanks has led to the proposal in the Genebank Platform of a similar approach for the germplasm health units.

While standard operating procedures for genebanks existed before the CRP to some extent, they have been considerably enhanced during its lifetime. QMS has indeed provided a formal framework permitting genebank staff to analyze genebank operations in detail and to provide appropriate documentation for standard operating procedures protocols in each genebank. These are dynamic documents subject to constant review and revision as necessary, and they include versions in local languages. Equally important, if not more so for some genebanks, is the significant and positive change in culture and work ethic enhanced by the QMS. As the Evaluation Team members met with national staff in the five genebanks they visited (at CIP, CIAT, CIMMYT, ICRAF and ILRI), common feedback was: QMS had enabled staff to take ownership and pride of their assigned genebank operations and tasks. It was also clear that morale among staff was high, and this is directly due to positive changes through QMS and the primary benefit of the Genebanks CRP of stable funding that has permitted multi-year planning of genebank operations and, more importantly perhaps, follow-through and completion of assigned tasks.

Among QMS priorities, succession planning has been highlighted as an important component of genebank planning. During Center visits, the QMS Coordinator also discussed this issue (and other human resources issues) with senior management of Centers. Long-term planning for genebanks should ideally include timely and internationally targeted searches for genebank staff. This is particularly important as the Genebanks CRP transitions to the Genebank Platform, since several genebank managers are due to retire over the next three to five years. The Evaluation Team noted that in one Center at least, CIAT, the recruitment of a new genebank manager from January 2017 included an eight months overlap with incumbent manager from earlier in 2016. The Team considers this very good practice.

The Evaluation Teams concludes that the QMS has been very well received at the genebanks. In the following three areas the QMS has led to very positive results by:

- enhancing standards across CGIAR genebanks, and this has been facilitated by cross-genebank learning approaches;
- promoting accountability and ownership of genebank operations at all staff levels; and
- helping Centers to address non-financial resource aspects of the long-term security of genebank collections, such as staffing.

The Evaluation Team deems it advisable that all Centers formulate succession plans for senior genebank staff, bearing in mind the existing needs for genebank operations and security, but also taking into account how new ‘omics’ science²² can make these collections more useful and accessible in terms of the genetic diversity they contain. QMS has also highlighted the importance of other issues such as staff health and safety. Because the development of standard operation procedures requires genebank staff to make a thorough analysis of each of the genebank operations, and their consequences, this has enabled staff to understand and appreciate that genebank operations are not just technical. They also have the potential to impact on the well-being of staff involved, because, for example, some operations require exposure to very low temperatures in the storage vaults or the use of potentially harmful chemical reagents.

Two Centers (CIP and CIMMYT) were using the International Organization for Standardization (ISO) approach before QMS was implemented. While such ISO certification does not encompass all genebank management and operations *per se* in the way that QMS is intended to do, both Centers have already made big investments in terms of time and resources to achieve ISO status and obtain ISO certification, and wish to continue with that approach. Until the new QMS has the same level of recognition, losing ISO certification could potentially harm the quality reputation of these Centers. For the current QMS, there remains a question of how it could be externally moderated or certified in the same way that ISO certification provides an external stamp of approval. The merits of achieving external certification should be considered; if indeed it is actually needed and to what extent it could thus obtain similar recognition as the ISO certification. The Evaluation Team considers that the benefits from QMS have been very clear from the earliest stages of the CRP, and encourages its full implementation in the centers with genebanks.

The Genebanks CRP has made a major effort implementing the 2014 FAO Genebank Standards through QMS. The Evaluation Team, therefore, thinks it is important - essential even - that the FAO Commission receives comprehensive feedback on how the standards are being applied, and the distinct advantages of distilling the comprehensive FAO standards manual into a set of approaches and procedures that can be easily implemented by genebanks. This would be a useful lesson and feedback for all genebanks worldwide. A QMS manual is being developed, and the Evaluation Team was shown an early draft by the QMS Coordinator.

There are some areas, such as common performance targets, where only limited harmonisation has been achieved. Differences in types of collections and species, and particularly in terms of the differing

²² Science and technologies primarily aimed at the universal detection of genes, mRNA, proteins and metabolites (genomics, transcriptomics, proteomics, metabolomics, epigenomics). Analysing and integrating information from ‘omics’ is key to understanding the links between genotypes, phenotypes and environment and their inter-control.

biology of the species, means that ‘one size doesn’t fit all’ - progress towards targets happens at different speeds, which does not necessarily mean poor performance. This is particularly the case for crops with recalcitrant seeds, those where seed viability is intrinsically low, and those that are maintained clonally or in field genebanks. Agreeing that these differences between species are a reality would in a sense be considered as harmony achieved, since while annual performance targets are needed, they have to reflect the progress according to challenges specific to different species (discussed in more detail in section 3.4).

Human resources are an issue for many genebanks but with no commonly shared views on what is the optimum number of staff needed. Since the genebank operations for different crop collections (seeds versus *in vitro*, for example) are not easily comparable, the staff requirements are often quite different. The Evaluation Team agrees with genebank managers that with increased staff (both national and international), genebank performance could be enhanced simply in terms of the annual throughput of germplasm samples for regeneration, viability testing, or safety duplicate storage, for instance. Any reduction in staff numbers potentially affects genebank operations negatively. There are cases where a small number of senior scientists have to deal with a large range of species and it is important to recognize these cases especially. Hence synergies and improved harmonization cannot really be enhanced by way of savings in human resources, but there is scope to improve the situation if genebanks that share specific challenges worked closer together such as Centers conserving the same crops (for example, CIMMYT and ICARDA for wheat, or IRRI and Africa Rice for rice) or following similar approaches for vegetatively propagated species (yams, potatoes, cassava). The conservation challenges for ICRAF are, in many ways, quite distinct given the range and biology of the species in its mandate. Nevertheless, ICRAF has taken advantage of its membership of the Genebanks CRP to avail of expertise in other genebanks across CGIAR to make progress in its own conservation agenda.

In conclusion, synergies are well recognized and harmonization has been achieved to a very high level within the CRP. While the Evaluation Team does not have a baseline or benchmark for harmonization before the CRP against which to judge the current situation, the Team’s assessment of progress through the QMS shows that harmonization has increased in many areas and is attributable to the CRP.

The Evaluation Team did not explore in detail the interaction between the Genebanks CRP and other CRPs. Separation of genebanks operations from the research and breeding that potentially make use of the crop collections has made sense, in the Team’s view, given the international status of the crop collections, and the dependency of their sustained availability on secure, long-term funding and prudent management. As the use of the collections happens in the commodity programs (and in other organizations outside CGIAR), CRP linkages and collaboration should be of high priority. The CGIAR Portfolio structure in Phase II with CRPs and Platforms that deal with similar issues (Excellence in Breeding and Big Data Platforms, in addition to the Genebank Platform) and clearly defined impact pathways, will provide an opportunity to enhance interaction and synergy among the Platforms and other CRPs. Notwithstanding, it is essential that the genebanks reach out to other Agrifood-systems CRPs and Platforms, and this is reciprocated. For fruitful interaction, two-way contact and dialogue is needed.

Recommendation 7. Given that the Quality Management System has become a key mechanism for enhancing genebank operations, the Genebank Platform should build on this success by:

- compiling lessons learned from Quality Management System to operationalize the FAO Genebanks Standards into easily implementable approaches and procedures, and report regularly to the FAO Commission on their use which would help genebanks worldwide to enhance their performance;
- determining, at the earliest opportunity, if external validation of Quality Management System is needed and if so, what form it should take, and to whom such a validation role might be assigned.

3.3. Genebank performance

The Evaluation Team assessed the effectiveness of how Center genebanks were meeting their conservation mandates (i.e. how they are performing) by analyzing improvements in genebank management facilities that have led to higher quality processes and more secure conservation. Data management systems that are important for providing access and enhancing the use of the collections are discussed in section 3.6.

Gap analysis, seed longevity studies (see Box 1) and sharing of cryo-protocols have been important for improving genebank performance.

Box 1: Synergy among genebanks: the seed longevity initiative

The seed longevity initiative is an excellent example of how genebanks facing similar challenges have shared information, and came about following the genebank reviews proposing that efforts should be made to understand whether viability was being maintained in Center genebank seed collections. One of the approaches was to look for efficiencies with respect to viability monitoring. Given its in-house expertise, IRRI was asked to lead a cross-Center data analysis study. ILRI sought additional expertise from the University of Reading, UK to work on its complex data (seeds of many forage genera and species, multiple seed lots, varying test conditions). It became clear that there might not be data available that could be used to improve understanding of seed longevity per se; and there was a need for advice in some Center genebanks on many aspects of seed processing, storage and viability testing, not just longevity.

It was also apparent that looking at the viability monitoring data it was possible to understand what had been happening in the genebanks over many decades and, for example, identifying failings in data collection and database design. Indeed, some Centers needed time to check and correct, or even compile the relevant data. Some Centers also expressed concern about sharing the data without a formal agreement in place (and this particular point is addressed elsewhere in this report). This has regrettably caused delays in terms of delivering the expected outputs of this initiative.

Targeted training on seed processing, storage, and viability testing for staff was identified as a real need across all Center genebanks, and has been included as a key component of the collective action planned for the Genebank Platform. Being able to share the lessons learned and to prepare joint strategies for genebank improvements in the Platform is one of the visible successes of the Genebanks CRP.

The Evaluation Team found that the Center genebanks have been upgrading their operations and facilities during the Genebanks CRP. The Evaluation Team, however, notes that there were studies and projects in the past that also made recommendations for upgrading genebank operations. It came as a surprise to the Evaluation Team to discover that many genebanks had not followed through with many of the recommendations each received in the 1996 Internally-commissioned External Review of

CGIAR Genebanks (under the SGRP). Nor had the World Bank Global Public Goods Projects 1 and 2²³ resolved limitations some genebanks were still facing in the decade leading up to the implementation of the Genebanks CRP. The Team can only surmise, backed up by one or two interview responses, that genebanks had neither the resources nor confidence to eliminate those bottlenecks identified earlier, even though these should have been given, in the Team's opinion, some degree of priority by Centers.

Box 2: Conclusions and Recommendation from External Technical Reviews and Recommended Actions Plans (RAPs)

- In all cases, the uniqueness of the collection, as well as the genebank facilities, were strong highlights in the independent reviews.
- In some cases facilities were highlighted as requiring improvements. Examples of such improvements requested include adequate threshing and storage facilities (AfricaRice) installation of oxygen alarm systems (Bioversity),
- Recommendations for improvements in routine operations included improved workflow
- Systems and seed management and seed viability testing processes (AfricaRice, CIMMYT)
- For some genebanks, the review team highlighted the need for improved data management systems, including improvement in bar-coding systems, as well as use of Genesys as a gateway to access information on the collection (AfricaRice). Reviews also included the need for user analysis of the collections
- Risk management strategy pertaining to individual genebanks needed improvement, which later addressed through QMS and annual reporting
- Need to address gaps in the collection, as well as for rationalization of collections and, especially in collaboration with other Center genebanks (AfricaRice, CIMMYT, ICARDA, IITA).
- Reviews also recommended identifying and prioritizing vulnerable accessions in terms of treatment and conservation management (Bioversity).

Under the CRP, there were several activities aimed at enhancing Center genebank operations and performance. Many of these also enhanced synergy and harmonization among genebanks (and thus are mentioned also in Section 3.1). The most important activities included:

- participating in GOAL workshops;
- implementing QMS (or further enhancing ISO in the two Centers, CIP and CIMMYT, that had already embarked on this approach);
- resolving seed conservation and longevity issues through a cross-Center initiative led by IRRI (see Box 1);
- expanding *in vitro* and cryopreservation approaches and sharing information across Centers (CIP, CIAT, IITA and Bioversity International);
- enhancing data management capabilities of GRIN-Global following evaluation by Centers of its capacity to meet their genebank needs, and its adoption in some Centers; and contributing more effectively to Genesys;
- bar-coding germplasm and ensuring its use throughout all genebank operations; and

²³ GPG Phase 1 was a strategic investment and collective action for "rehabilitation" of global public goods in the CGIAR genetic resources system; GPG Phase 2 aimed also to rehabilitate and to enhance the CGIAR Centers' capacity to conserve and provide plant genetic resources and associated knowledge to users worldwide.

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- accelerating (to the extent possible) safety duplication of seed collections in the SGSV, or in the case of ICRISAT, establishing its primary safety duplication options in addition to samples sent to the SGSV.

The external reviews conducted on all 11 genebanks over 2012-2016 (see Section 2.3.4) were an important means for identifying issues and bottlenecks in individual genebank performance. Not only were the reviews comprehensive, but funds were allocated under the Genebanks CRP to draw up a prioritized list of actions under an agreed, and funded, RAP. Examples of recommendations from the external reviews that were addressed through RAPs are given in Box 2.

As a result of all these efforts, the Center genebanks are, in the Evaluation Team's view, now in a much better situation than before the Genebanks CRP. Centers developed long-term plans and, probably for the first time in the case of several genebanks, have been able to implement these plans without interruption largely due to the stable funding for genebank operations in the past five years. The most important achievements at Center genebank level that the Evaluation Team considers are clearly associated with the Genebanks CRP are presented in Table 4.

Table 4: Genebank Achievements from 2012-2015

AfricaRice	-Availability of characterization data as a means to facilitate access to germplasm in genebanks, with annotated images of germplasm -Introduced and secure accessions in MTS/LTS -New genebank building in M'be by March 2017
Bioversity	-Relaxation of guidelines related to health and distribution leading to more distribution -New <i>Musa</i> germplasm information system (MGIS)
CIAT	-90% safety at SGSV -Upgrading of GHU and registration with Colombian authorities
CIMMYT	-Seeds of Discovery (Mexico and CRP Wheat) had impact on genebanks -Fostering communities and their values (popcorn, community genebanks)
CIP	-Fingerprinting for identity verification of clonal potato and sweet potato completed -Secured funding for developing new phytosanitary cleaning methodology (with IITA)
ICARDA	-Decentralization of genebank activities to Morocco and Lebanon; Lebanon – equipment and facilities for regeneration and characterization; Morocco – small genebank
ICRAF	-Collection data cleaned and available in Genesys -Collections without initial viability data are now packaged -Development of <i>Acquisition and Curation Policy</i>
ICRISAT	-Export of germplasm from India resolved
IITA	-Cryopreservation protocols for cassava -DNA fingerprinting -Enhanced seed longevity -Capacity development
ILRI	-Progress with bar-coding and e-data capture (quality) -Renovation of facilities
IRRI	-3000 whole genome sequences -Improving conservation through new seed processing, conservation of genetic stocks, bar-coding, seed longevity and prediction of longevity

Source: self-reporting from genebanks

The Evaluation Team concludes that the stable and guaranteed funding for genebank operations has brought about a major improvement in genebank operations across all Centers. This has been in spite

of some limitations deriving from the 2011 Costing Study that was the basis for budgets for different crop collections, as explained earlier (see 2.3.6). Apart from what is covered in the Costing Study, funding through the Genebanks CRP has supported purchase of equipment in several centers. These investments in capital requirements will certainly result in better and safer conservation and will likely have also cost saving effects. While genebanks have their specific capital requirements, some new facilities such as the automatic seed sorter installed at IRRI is intended to become a model for other genebanks if it proves to fulfil its potential. The Evaluation Team considers that these investments (see detail in section 2.3.5 on financial management) and developments related to their use and sharing are very likely also a result of the stable funding environment for genebank operations.

Two special cases where the Genebanks CRP has contributed directly to performance of individual genebanks merit special comment.

- Without the support of the CRP the already dire threat to the collections held by ICARDA in war-torn Aleppo, Syria would have escalated even further. Notwithstanding the fact that operations of the ICARDA active collections continued at the Center's former Aleppo headquarters, which has been amazing, ICARDA has now established new genebank facilities in Morocco and Lebanon, and began to reconstitute its collections by withdrawing accessions from those already safely duplicated in the SGSV, with support through the Genebanks CRP. The Team feels that this has demonstrated the operation of conservation that is of truly global significance.
- Until recently, germplasm of agroforestry species had not been fully included in the overall CGIAR portfolio of germplasm collections. ICRAF is now a full member of the CGIAR 'genebank club', and receives its appropriate and fair allocation of funding to maintain its genebank operations. While, according to testimony, the particular complexities of conservation of many agroforestry trees and fruit species were not initially nor fully understood by the CRP management, the Evaluation Team learned that ICRAF had no inventory of their own collections and were unable to provide a list of field sites and species until more than a year after the CRP was initiated. Consequently, the ICRAF genebank manager had to justify the special costs entailed and what is needed for both seed storage and field genebanks across multiple sites in Africa and in one country in Latin America, Peru.

The Evaluation Team analyzed genebank performance data in the ORT and the CRP Achievements Matrix (as discussed in section 2.4.2 the annual reports did not provide sufficiently consistent data). This year-by-year analysis and discussions with genebank managers indicates that genebanks are improving and on trajectories to meet the conservation and operational projections described in the Genebank Platform proposal. However, this is not happening at the same pace across all crop collections. Indeed, a "steady state" (such as elimination of regeneration backlogs, or germplasm safely duplicated at the SGSV and elsewhere) will not be reached in all genebanks for some years to come. The very concept of "steady state" was refuted by some genebank managers as a misguided concept, because collections would continue to change in a dynamic manner, as germplasm gaps are filled (with collections potentially increasing in size), and use of new technologies permits rationalization of germplasm holdings.

The resources needed to work with different crops are not the same precisely because of differences in life form (trees, perennials or annual species, for example), whether germplasm is conserved as

seeds (orthodox vs. recalcitrant) or vegetatively, and different breeding systems (inbreeders vs. outbreeders, etc.). Some crop collections pose a particular challenge; the upland maize varieties at CIMMYT are an example. Not only has it been difficult to regenerate these varieties in Mexico outside their native South American environment but, as with all maize, the crop's outbreeding system requires special attention in the field to prevent cross pollination between different varieties. Meeting some of the performance targets for subsets of germplasm ranging from these upland maize accessions to those species with recalcitrant seeds is a particular challenge. Standards and targets are discussed below in more detail.

3.3.1 *In vitro* conservation

In vitro culture is the best way to preserve genetically stable and long-term living clonal plant material. Therefore, CGIAR has five clonal genebanks (IITA, CIAT, Bioversity International, CIP, as well as ICRAF for a small number of accessions), which are at the forefront of clonal conservation globally. As an example, the CIP genebank is the largest and maintains over 15 000 accessions *in vitro* (potato, sweet potato, and Andean root and tuber crops). In the past ten years CIP has instigated very strict ISO standards for the maintenance of its *in vitro* material with a contamination rate of less than 0.2 percent as a result, which is commendable. Currently the entire *in vitro* process at CIP can be virtually paperless, since every process from nutrient medium preparation, to transferring, to monitoring cultures during *in vitro* growth and to distributions are now tracked by bar-codes, as it is at CIAT also, where bar-coding systems had already been developed earlier. Inventory of cultures, as well as chemical reagents for media and even washing of culture vessels are also monitored electronically to aid in efficiency. These paperless procedures have been shared with other genebanks beyond clonal genebanks, including seed banks. Another excellent example of collaboration in the *in vitro* operations facilitated by the Genebanks CRP, is the transfer of the cassava *in vitro* protocol from CIAT to IITA in 2012.

Quality upgrade in the clonal genebanks can be necessary because errors concerning the integrity of the collections remain in the vegetative cultures over decades and can thereby become amplified. An example of a necessary quality upgrade at CIP's clonal potato and sweet potato collections is presented in Box 3.

Box 3: Quality upgrading in CIP's potato and sweet potato collections

CIP recognized the need to address historical identity error rates in its *in vitro* collection, concerning material, which had been in culture for over 30 years. In order to address this problem, it was decided to reduce all *in vitro* accessions to a single plantlet (to eliminate all within-accession variation) and re-initiated all cultures from the single plantlet per accession. This same plantlet and its identical clonal progeny, were also used for fingerprinting and field evaluation.

Fingerprinting of the *in vitro* potato and sweet potato collections is almost complete and comparison with original mother plants (90% exist for potato and ~45% exist for sweet potato) maintained over the past 30+ years in the field (potato) or greenhouse (sweet potato) have revealed close to a 20% error (verified by historical data) in the clones in the *in vitro* collection. No association was found with the timing of the errors and hence it is assumed they simply accumulated over time.

Strict quality management programs are now in place with the clonal collection, and a monitoring program using DNA fingerprinting to periodically check *in vitro* cultures will be in place in 2017. Such measures will ensure that the identity of the collection is now maintained.

While the Team has no evidence for similar situations with other *in vitro* collections elsewhere, the lessons from the CIP experience indicate that the application of rigorous standards is essential for *in vitro* conservation so that users can have full confidence on the identity of the accessions and accuracy of information concerning the collections.

3.3.2 Cryobanking

Cryopreservation is used for very long-term storage of plant material under liquid nitrogen at -196°C. While plant material has been held in cryopreservation for less than 50 years and hence exact data on long-term longevity is not available, theoretical survival rates are believed to be for hundreds of years. There are published reports for an increasing number of plant species that have successfully been cryopreserved, and the cost savings for long-term conservation, especially for clonal species would be significant, if successful protocols can be developed. However, so far the number of large-scale germplasm collections cryopreserved are few, both for seed (aside from the USDA seed storage in Fort Collins, Colorado) and clonal. CGIAR is in the forefront of cryobanking initiatives with both CIP (potato) and Bioversity International (*Musa*) successfully placing an increasing number of accessions of their collections into cryopreservation.

Protocols for cryopreservation are often crop-specific, extremely labor intensive, and so far available only for a few crops. Upfront costs for cryopreservation are very high, but when the costs are spread over the hundreds of years of secure storage, it is likely to be the most cost-effective means to conserve clonal material in the long term, if it is biologically and technically feasible. Compared to the relatively high costs of backing up *in vitro* material cryopreservation remains the most promising long-term conservation strategy for clonal crops. Based on the cryopreservation vision put forward in the original CRP proposal, there has been wise investment in supporting cryopreservation programs, achievements in this areas include:

- cryopreservation of banana and plantains in Bioversity International, and cassava and yam at IITA;
- upgrading the CIP program with the acquisition of a liquid nitrogen generator which is already running;

- capacity building to optimize the procedures.

Nevertheless, scaling-up of capacity to handle more material annually, and how this can be achieved, is a challenge for the Genebank Platform.

While the successful routine implementation of cryopreservation protocols for CGIAR clonal germplasm collections only exist for potato and *Musa*, promising results have been achieved for sweet potato and for cassava (for which a good working protocol exists but is not yet routinely implemented). Cryopreservation protocols for other clonal crops such as yam have been developed, but need to be optimized. Given that ICRAFs clonal collections are applied to only a few accessions, cryopreservation would be interesting but not a high priority. ICRAF would benefit from cryopreservation of its germplasm collection but, given the lack of suitable protocols, does not have a cryopreservation program as yet. Its feasibility and cost should be analyzed thoroughly, and priority species identified for which cryopreservation would bring additional conservation advantages over and above the approaches currently used.

3.4. Standards, indicators and targets

From the start of the Genebanks CRP, it was decided to use a set of performance indicators to monitor how individual genebanks were upgrading their operations, for example making their collections safer, and better documented in terms of characterization data. The ORT has been the main mechanism to track progress in genebanks.

The Evaluation Team endorses this approach because monitoring achieves two objectives. First, it tracks how genebank operations changed to increase the security of the germplasm collections; and second, it demonstrates to the donors what the achievements have been as a result of their funding. For the latter, however, information in the ORT was not sufficiently presented in the annual reports. From AGM records (and having observed the AGM in 2016), the Evaluation Team notes that the indicators and targets have been the topic of discussion during three AGMs. A working group was set up to refine them as early as 2013, but the variation in reporting on indicators continued up to the present.

For monitoring progress towards achieving standards, the Evaluation Team sees two main shortcomings in reporting to the Crop Trust (and also reflected in the annual reporting). First, while there was a clear need to set performance indicators specific to genebanks that would be the basis of the performance contract for the CRP, the indicators did not provide a fully suitable framework for monitoring progress. The targets were not set consistently to allow monitoring of incremental changes with confidence towards achieving overall conservation standards (as defined by FAO). Setting of the targets overlooked to some extent the challenges faced by many of the 11 genebanks, because they did not sufficiently reflect the biology and complexity of the different germplasm collections.

The Evaluation Team found the ‘traffic lights’ performance tables in the CGIAR Portfolio reports were somewhat misleading, giving an impression that the CGIAR genebanks are falling short in terms of their overall performance. Taking three examples, indicators included percentage availability of the collection; percentage of the collection safety duplicated (security), and data availability - with a target set at 90 percent for each genebank to meet. In reporting, Centers are genebanks are grouped in

3 categories: targets met, over 50 percent, or under 50 percent met. Therefore it is impossible to determine how much progress a genebank has actually made over the year.

Stepwise graphs for some indicators by genebanks were presented in some annual reports but the overall take-home message from the ‘traffic lights’ tables gives a different perspective. Furthermore, in the 2013 report, the security standard was just 50 percent for clonal crops but 90 percent for seed crops. In the 2015 report, in contrast, the security standard for clonal crops and tree species had been increased to 90 percent with no explanation of why this had occurred nor any allowance, apparently, for the difficulties with these species.

Monitoring genebank performance in the CRP follows the Crop Trust’s practice to establish eligibility criteria for the long-term grants. These criteria were already established before the CRP was launched, and as a basis for upgrading genebank operations of all international collections potentially supported by the Crop Trust. For eligibility to receive the long-term grants there is an obligation to meet conservation standards set by FAO. Not all CGIAR genebanks are yet fully eligible to receive endowment support, which in any case is not yet sufficient to support all collections. However, the rigor practiced by the Crop Trust in the CRP to boost genebank performance through support and accountability for all funding dispersed has been commendable.

The Evaluation Team learned that the Genebank CRP has agreed a set of annual targets for each genebank collection, submitted by each genebank. This is important to permit reporting on achievements and for identifying which Centers are failing to make satisfactory progress towards the overall genebank standards. However, the Evaluation Team received feedback that the targets do not sufficiently reflect understanding of the constraints underpinning any lack of progress, which may be collection specific. In designing optimal monitoring and reporting in the Genebanks Platform, it is important that each genebank responds to targets in a manner that is appropriate to its collection(s), and the annual progress in achieving those targets is monitored, irrespective of what other CGIAR genebanks are achieving.

3.5. Cost-effectiveness

A number of specific actions aimed at enhancing cost-effectiveness were initially envisaged, such as developing common databases, reducing unnecessary duplication, achieving a better division of labour, harmonizing quality assurance standards and performance reporting, and strengthening collaborations. In this section, the Evaluation Team considers activities that have led or have the potential to lead to cost savings in the longer run.

The Evaluation Team recognizes that the implementation of common approaches and improved collaborations among the genebanks to develop the QMS has been successful. Several examples have been given in the previous sections about sharing and learning among the genebanks about the standard operating procedures and protocols that can speed up adoption of more appropriate processes that also help save costs. Examples include bar-coding, DNA fingerprinting for quality assurance in *in vitro* collections and better data management (see the next section).

Another initiative which could in future result in tangible cost savings is the Focused Identification of Germplasm Strategy (FIGS; see Box 4) that allows efficient selection of germplasm material for use.

Box 4: Focused Identification of Germplasm Strategy

FIGS is a relatively new and indeed novel approach for searching genebanks, that aids crop breeders and genebank managers to achieve faster and better targeted identification of genetic traits to improve crops. FIGS combines agroecological information with data on plant traits and characteristics. FIGS datasets identify sets of plant genotypes with a higher probability of containing specific 'target' traits. For example, FIGS uses the ecogeographic data from passport data from germplasm that has resistance to diseases or pests or tolerance to abiotic stresses, to identify a small subset of valuable germplasm.

FIGS results in the selection of a relatively small sample of genebank accessions (smaller than in core or even mini-core collections) that have a high probability of possessing the trait desired by a particular breeder for a crop. The efficiency of sample distribution upon request is greatly improved as is the successful use of germplasm in crop improvement.

FIGS was developed jointly by ICARDA, the Vavilov Institute of Plant Industry in Russia, and the Grains Research and Development Corporation in Australia. It has already been used in a number of successful examples:

- 16% 'success rate' in identifying genotypes resistant to powdery mildew disease, compared to the 5 to 6% typically obtained with traditional screening methods.
- Identified the first-ever sources of resistance to the most virulent biotype of the Russian wheat aphid

There seems to have been an expectation when establishing the Genebanks CRP that greater collaboration among Center genebanks would, in general, lead to cost savings. The Evaluation Team did not find evidence of that and thinks that, in general, the upgrading of facilities and operations will not bring about significant levels of cost savings among collections, although it is necessary for each genebank to operate efficiently and effectively. Collaboration on the use of facilities may increase cost-effectiveness, but the cost-effectiveness gains across the System are not very clear yet, and the Evaluation Team recognizes that it takes time to roll out potential cost-saving measures, such as the adoption of uniform protocols.

Particularly, a common expectation has been that rationalization of collections by identification and elimination of duplicate samples across collections, as was initially an objective, would bring cost-effectiveness for seed collections. However, given the considerable time, effort and cost needed to identify duplicates accurately, and given that none of the genebanks have storage space constraints at present, the Evaluation Team doubts the saving from such activities and questions the elimination of duplicates in seed collections as a priority.

Nevertheless, plans are advanced (based on an external consultant's report) for closer collaboration between CIAT and ILRI (and possibly ICARDA for temperate forage species) to jointly manage their tropical forages collections. This is logical given the range of species, the complexity of germplasm management operations, and the need for species prioritization for conservation among collections.

For vegetatively propagated collections, such as potato or cassava, the costs of conserving the collections *in vitro* or in cryopreservation is significantly higher than for seed collections. Therefore, the elimination of duplicates would be much more likely to bring savings for clonal collections, and this approach has been prioritized in the respective genebanks. Further, the Evaluation Team suggests that an analysis is undertaken to determine the scale of potential duplication of vegetatively propagated species across genebanks. This analysis will, at the very least, allow genebank managers to assess what

actions if any need to be taken. It will likely demonstrate that the genebanks are aware of the potential cost savings that could be achieved, and actions that would need to be budgeted for if they were considered necessary for eventual cost-effectiveness.

In conclusion, the Evaluation Team recognizes that much progress has been made through the Genebanks CRP to increase cost effectiveness where possible. The cross-center initiatives such as QMS are having an impact in individual genebanks. It is essential that these activities are continued with the same enthusiasm in the Genebank Platform.

3.6. Data management

Efficient, secure and reliable data management systems are essential to achieve the objectives of the Genebanks CRP: to conserve the diversity of plant genetic resources within CGIAR and to make that diversity available to breeders and researchers. Indeed, improvement in data management and capacity was recommended in nearly all external reviews and became a priority in subsequent RAPs. There are various aspects to the data management activities in which the Genebanks CRP has been involved, but the main activities focus on two pieces of software, namely Genesys, as a global portal about plant genetic resources information, and GRIN-Global, a genebank information management system.

Genesys²⁴ was created in 2008 (prior to the Genebanks CRP) by the Secretariat of the International Treaty and the Crop Trust. It superseded and built on SINGER (the CGIAR System-wide Information Network for Genetic Resources that was a product of the SGRP at Bioversity International). In 2012 the Crop Trust became the legal entity responsible for the development of Genesys. The Crop Trust Information Systems Manager for Genesys has worked under the CRP since its start.

Genesys is available globally to provide access to data on plant genetic resources maintained in international and national genebanks around the world, including the CGIAR genebanks. It is a window, as it were, on those collections contributing to the database. Data made available includes accession-level passport, characterization and evaluation data. Additionally, crop collections can share data according to agreed standards, and consequently contribute to a global information system on crop diversity. The Evaluation Team was told that some national genebanks (such as the Ethiopian Biodiversity Institute in Addis Ababa that the Evaluation Team visited) access information by way of Genesys, but do not actively contribute data. All 11 CGIAR genebanks are contributing data to, and using Genesys (Bioversity International uses the *Musa* Germplasm Information System which links to Genesys). Many interviewees stated that Genesys is clearly superior to SINGER. From its own knowledge of the two systems, the Evaluation Team confirms this. However, the Team also received some criticisms of Genesys, specifically in terms of its scope and content. Overall, however, the Evaluation Team is satisfied that the system is fulfilling one of its primary objectives of permitting access to information about the CGIAR genebank collections (and those in many national genebanks around the world).

The data now available globally through Genesys are substantial. While the frequency of updates to Genesys has increased considerably towards the end of the CRP, updating of data is not as frequent as

²⁴ <https://www.genesys-pgr.org/welcome>

desirable. It should become an obligation on genebanks. Some Centers have developed applications that automatically update data to Genesys. To the extent possible, others should follow this example.

An important aspect that the Team emphasizes is that Genesys presents a means of enhancing germplasm use (particularly with FIGS; see Box 4) as well as identifying gaps in collections that might be filled in the future if resources are available (although some limited collecting has taken place under the CRP). However, both of these will depend on increasing the availability of characterization and evaluation data in Genesys, not only passport data. Agreements with breeders will be important in this respect. Discussions have been under way since early 2016 to facilitate the submission of phenotypic data to Genesys, which is seen as important by the Evaluation Team.

GRIN-Global is a version of the Germplasm Resource Information Network (GRIN), developed initially as a joint venture between USDA-ARS and the Crop Trust for use by any interested genebank in the world. It is a data management system for genebanks. Among its important functions, it “provides complete genebank inventory management application”²⁵. In many CGIAR genebanks, existing data management systems have been functioning on platforms that were either outdated, inadequate or soon to be unavailable. The GRIN-Global pilot project within the CRP was initiated in 2013 by CIAT, CIMMYT, and CIP. In 2015, GRIN-Global was implemented for wheat and maize at CIMMYT. It is currently being used at CIMMYT, while CIAT, CIP, ICRISAT, IITA, ICRF, Bioversity International and Africa Rice are in the process of switching systems and starting implementation. Various workshops have been held organized by the Senior Software Developer, GRIN-Global International at CIMMYT. A technology company has been hired to develop a publishing tool, which will allow GRIN-Global to feed data directly into Genesys; linking both databases is indeed needed. The lack of compatibility between breeders’ data and GRIN-Global is perceived by several stakeholders as one of the issues still to be improved.

However the lack of adoption of GRIN-Global by all genebanks is due to a number of issues, best exemplified by IRRI. At IRRI an in-house data management system was developed in the 1990s that has links directly to breeders’ database. Furthermore it encompasses genebank operations in a manner not yet achieved with GRIN-Global. IRRI however faces some challenges. The in-house system is not available for use outside IRRI and is coming close to being inoperable because of the ageing operating system on which it resides.

3.7. Conclusions

There is overwhelming agreement among stakeholders that Genesys satisfies most of the data access requirements for genebank managers and users of germplasm. The Crop Trust/CRP staff have done well to promote the use of Genesys amongst CGIAR genebanks in a relatively short space of time and all genebanks are now contributing data to Genesys. This represents a distinct improvement over previous arrangements.

However, the Evaluation Team learned that, in some instances, genebanks are not updating data as frequently as desirable. In terms of actual genebank management, the uptake of GRIN-Global amongst genebanks could have been faster, but the reasons given to the Team for hesitancy were

²⁵ http://www.grin-global.org/docs/gg_what_is_GG_2pp.pdf

understandable. These include current inability of GRIN-Global to link with breeders' information, and limited capability for dealing with clonal collections. The fact that USDA National Plant Germplasm System has now formally adopted GRIN-Global as have two Australian genebanks and others across the world, suggests that the CRP was moving in the right direction when promoting the use of GRIN-Global among the CGIAR genebanks. The Evaluation Team considers that in improving both Genesys and GRIN-Global, ability to link breeders' data with genetic resources data needs to be addressed in the Genebank Platform.

The Evaluation Team concludes that there are currently no internationally developed or freely available alternatives to either Genesys or GRIN-Global for the CGIAR genebanks.

Recommendation 8. Use of germplasm for research and crop improvement requires access to germplasm that has been adequately characterized and evaluated for resistance to and tolerance of biotic and abiotic stresses. In its future data development efforts, the Genebank Platform management should:

- enhance linkages between genebank characterization and breeders' evaluation and pedigree data; and
- expand the utility of GRIN-Global more specifically for *in vitro* collections.

4 System-level lessons from Phase 1

In this Chapter, the Evaluation Team highlights particular lessons from the five years of the Genebanks CRP going forward with the Phase II Genebank Platform. It also draws lessons of interest considering the CGIAR System's overall role, responsibilities and opportunities with regard to *ex situ* genetic resources conservation and use for furthering CGIAR vision and objectives. Such broader lessons include also observations about the linkages between CRPs and Platforms in the CGIAR Portfolio to be implemented in the second phase.

The Evaluation Team's task was not to assess the Genebank Platform proposal, but references the proposal where concerns identified by the Team will be addressed. The Platform proposal was rated 'A' by the ISPC in its September 2016 Assessment, in which it stated that "A collective approach to conservation and use of the plant genetic resources held in the CGIAR genebanks, following a harmonized policy via the proposed Genebank Platform, will ensure an effective and efficient System-wide research infrastructure and will strengthen CGIAR's role as a leading global player in this field". Nevertheless, the Evaluation Team took into account the extent to which the Platform is building on progress and carrying forward initiatives from the Genebanks CRP considered important by the Evaluation Team, and the extent to which broader concerns and shortcomings identified by the Team on CGIAR *ex situ* genetics resource issues seem to be addressed in the Platform.

Here the Evaluation Team, therefore, draws from its overall assessment and evidence used and relates this to what it considers will be important in the future for CGIAR to fulfil its obligations concerning the crops collections and enhance their use for maximum benefit in research, breeding and for the ultimate beneficiaries.

4.1 CGIAR meeting its genetic resources obligations

4.1.1 Policy and representation

Individually, Centers are meeting their international obligations under the International Treaty, and reporting to the FAO Commission. In particular, Centers have complied efficiently with requirements for the exchange of germplasm through the Standard Material Transfer Agreements (SMTAs); more than 95 percent of all SMTAs worldwide have been issued by CGIAR. The Genebanks CRP has enabled genebanks to enhance the conservation of their collections towards meeting international standards agreed by the FAO Commission as a result of secure funding and its central management for this purpose.

While Centers have continued to report as requested to the FAO Commission (concerning their stewardship of the in trust Article 15 collections) and to the Governing Body of the International Treaty, the restricted scope of the Genebanks CRP led to a weaker CGIAR representation on international bodies compared to the past when a deliberate coordinated approach was made through the SGRP, with Bioversity International taking the lead in this respect on behalf of CGIAR. This was a concern raised by a number of persons interviewed during this Evaluation.

Termination of the previous system-wide and system-level mechanisms to deal with international relations, without determining responsibility for these relationships in the new situation has had a negative result, which the Evaluation Team highlights as a concern. The relationship of CGIAR with the FAO Commission and the Governing Body of the International Treaty has not been as close as it was formerly under the SGRP. In the institutional arrangement for the Genebanks CRP the broader roles of CGIAR regarding international bodies were left undefined. The Evaluation Team considers it essential that CGIAR, not just individual genebanks as seems to be the existing practice today, actively engages again with these international bodies (and the Convention on Biological Diversity), because they are making decisions that could affect how Centers access and use germplasm. The plans described in the Genebank Platform proposal are leading in this direction.

Bioversity International has maintained genetic resources policy expertise and some activity. With the genetic resources community at the AGM 2016, its policy expert raised important policy issues affecting access to germplasm and benefit sharing that the Platform will need to take on board immediately. These issues require a system-wide position from CGIAR because they affect not only the operations of the genebank collections, but also the exchange of improved germplasm and the benefits that derive therefrom. The Evaluation Team notes that the System Management Board has considered establishing an *ad hoc* working group, *Positioning and Engagement on Genetic Resources*, even though no decisions have been made as yet. Nevertheless, the Team expects that the Board should provide oversight to these policy matters that are important for CGIAR.

Recommendation 9. For ensuring CGIAR's effective engagement in genetic resources policy dialogues and regular representation at international fora, the FAO Commission and the Governing Body of the International Treaty in particular, the System Management Board should oversee that the System Organization, Centers, and the Crop Trust as manager of the Genebank Platform clearly define and agree on their respective roles and responsibilities regarding representation of CGIAR internationally, taking into consideration that the Genebank Platform's policy module reports to the System Management Board/General Assembly.

4.1.2 *Germplasm health and conservation*

Genebanks have an obligation to distribute healthy germplasm. This is something that is important not only for the operation of genebanks; it also affects how CGIAR manages and distributes improved germplasm. Furthermore, understanding how diseases and pest can affect seeds and clonal material is necessary for conservation purposes. Germplasm health and quarantine, and research that is essential for developing improved conservation methods were not part of the Genebanks CRP, because it focused just on genebank operations for conservation. The Evaluation Team thinks that as the CRP proposal was being developed in 2011, the essential links between conservation and germplasm health and 'research' were not fully appreciated. Generating information to optimize conservation procedures such as seed longevity or cryopreservation, for example, is essential to raise and maintain conservation standards and enhance genebank operations. Under the CRP there was support for these activities that will continue into the Genebank Platform. The Genebank Platform explicitly includes research for conservation, which is essential for achieving the long-term security of the genebank collections. The Evaluation Team foresees that there will be need to prioritize carefully activities to be included. The Evaluation Team also believes it would be worthwhile to define and

prioritize a broader research agenda aimed at enhancing the use of the collections that builds on the system synergies resulting from the Genebanks CRP and the Genebank Platform, and propose how this could be funded and linked to the other Agri-Food CRPs.

Several challenges still lie in the interface between conservation and research for use, particularly related to information flow from users back to genebanks about the molecular characteristics and value of the accessions. Data from germplasm evaluation and molecular diversity data, often gathered by breeders, is infrequently returned to the genebanks and therefore accession-specific information remains incomplete for essential data that would help determine the use value of the germplasm.

A particular challenge and concern in the new ‘omics’ age (see section 3.2) is that of the ‘dematerialization of plant genetic resources’. Because data about the collections, particularly molecular data, are becoming almost as valuable as germplasm *per se*, there is potentially less need to physically access and use germplasm accessions in genebanks, which is the rationale for access and benefit sharing policies. The FAO Commission and the International Treaty are wrestling with this issue, and how access to and use of these data should be handled under the access and benefit sharing aspects of the International Treaty. As a major player in the multilateral system of exchange and use of plant genetic resources for food and agriculture, and with significant ‘omics’ research investments already aimed at unlocking the genetic diversity in its genebank collections, CGIAR can provide a unique viewpoint on how these developments can lead to more strategic use of germplasm to increase food security. The Genebank Platform needs to have representation in these international discussions, the outcome of which will impact not only on the CGIAR genebanks, but other areas of CGIAR activities as well that rely on the use of ‘omics’ data.

4.2 Promoting the use of CGIAR genebank collections

Agriculture worldwide has benefited immensely from access to and use of CGIAR’s genebank collections. For example, the introduction of resistance to grassy stunt virus in rice from a wild species, *Oryza nivara*, led to the development of the variety IR72 (that also has multiple landrace varieties in its pedigree), once the most widely grown variety of any crop. The deployment of submergence tolerance genes from rice landrace varieties has stabilized agricultural production in farmers’ fields in Bangladesh and eastern India where flooding in the past made rice agriculture unpredictable. Other examples of the economic value of potato and cassava varieties derived from germplasm in CGIAR genebanks has been documented by Robinson and Srinivasan²⁶. These examples are, however, from an era when value from genetic resources was determined through a systematic search through germplasm collections and contributions to conventional breeding. Use of the collections will increase with better information and the technical ability to analyze and deploy genes that are discovered.

The close institutional links between conservation of genetic resources and their use in research and breeding is a signature aspect of CGIAR. The Evaluation Team considered this question because the genebanks were placed in a separate program rather than being integrated with each of the crop or systems CRPs. It had to evaluate whether this structure had affected access to and use of the genebank collections.

²⁶ <http://impact.cgiar.org/files/pdf/GCCCE2013.pdf>

The Team received consistent feedback in favor of the separate organization of the Genebanks CRP, because this has given the genebanks a stronger collective identity and consequently made it easier to justify the stable funding that has been provided. While the Genebanks CRP has significantly strengthened the collaboration among CGIAR genebanks, it is important to monitor continually whether this institutional organizational structure in the new Genebank Platform will strengthen the link between conservation and use, and whether the interaction with the two other Platforms (Excellence in Breeding and Big Data) and Agri-food systems CRPs is sufficient.

The Evaluation Team found that the perception of 'use' has been variable among the genebanks and the CRP management and this may have affected the recording of use. First, use is often restricted to mean contributions to plant breeding only, whereas use in research (to determine diversity, pre-breeding, or conservation studies, for example) is also highly relevant. Second, differences in perceptions are at least in part due to differences in interpretation of what constitutes a germplasm sample. The issue again relates to differences in biology and what is actually conserved, such as seeds, *in vitro* cultures, and the like. The definition of what constitutes a germplasm sample is particularly moot when it comes to long-lived perennials like the agroforestry species conserved at ICRAF. It is not possible, nor appropriate in terms of genebank standards, to make a direct comparisons between the size of seed samples for a species such as wheat (for which there would be thousands of seeds, potentially) or a fruit tree species that might be represented by just a small handful of (often very large) seeds.

As there is currently no agreed understanding of the definition of 'use' of germplasm, the Evaluation Team suggests that the Platform should address this issue so that monitoring of use of the collections can be done appropriately. Further, any performance indicators about use should be defined beyond absolute numbers, but rather in terms of actual cost-efficient use for research and breeding, to take into account, for example, FIGS that can enhance use of germplasm while at the same time, reducing the numbers of samples distributed on request. The Team also encourages Centers to record (whenever possible) the use for which germplasm samples are requested, both inside and outside CGIAR.

4.2.1 Internal uses

Genebanks are maintained by Centers that also engage in genetic enhancement of the crops represented in the genebanks. While the number of accessions distributed within Centers and across CGIAR may be lower, this does not necessarily correlate with a reduced effective use. Requests may be more informed with better characterized collections driven by 'omics' research that is often based on smaller sub-sets of accessions. The most immediate use, by which the Evaluation Team considers research, pre-breeding, and use in breeding to produce new crop varieties, is generally in the home center of the genebank. That is not to say that the exploitation and use of these collections in their 'home' centers is at the same level in all Centers. In rice for example, there is a long history of evaluation of germplasm accessions (both cultivated and wild) in the International Rice Genebank at IIRR, and then incorporation of accession material in the pedigrees of released varieties that are grown over millions of hectares. In contrast, the situation with maize is quite the opposite, because of the crop's outbreeding system and the time it takes to develop elite genepools. Maize breeders informed

the Evaluation Team of their reluctance to introduce ‘alien’ genes that would disrupt the genetic make-up of their breeding populations.

These examples are, to some extent, at opposite ends of a germplasm conservation-use continuum, and demand for novel sources of genetic variation that varies among crops. Nevertheless, the Evaluation Team was told by several Center Directors and breeders that the long-term security of CGIAR’s collections was of fundamental importance, even if breeders were not dipping into these genepools currently or even on a regular basis. There is expectation that the various ‘omics’ approaches will facilitate more use of germplasm collections. It is for this reason that the Team stated earlier in this report (see section 3.2) that as several genebank managers retire over the next five years, it is important that they are replaced by staff who will be better placed to take advantage of the ‘omics revolution’ and thereby strengthen significantly the links between conservation and use.

With the CGIAR Reform, the linkage between the genebanks and crop related research and pre-breeding has somewhat changed in that several CRPs combine many centers’ efforts on single crops (wheat, maize, rice, cassava, banana and plantain, and some legume crops) and this could be expected to enhance exchange of genebank materials and information across centers more than before. Evaluation of the Global Rice Research Partnership CRP (GRiSP) found that such exchange has increased with rice.

During the five years of the CRP, funding decisions affected the Genebanks CRP and other CRPs differentially; while considerable cuts to Windows 1 and 2 were applied to the research programs, the Genebanks CRP funding was not cut. However, the Evaluation Team did not specifically collect evidence on areas of research that, due to those funding cuts, were reduced in the other CRPs. Testimony from a wide range of stakeholders including genebank managers and breeders indicated that some activities such as genetic resources research (both for conservation *per se*, and evaluation of germplasm) and pre-breeding were affected in terms of not being started or being reduced. In some cases, germplasm research was included in the portfolios of other CRPs, but was not funded. However, GRiSP did maintain its support to these areas. This decision built on the decades-long approach at IRRI of supporting genetic resources research including seed conservation and diversity studies. It had positive consequences as IRRI was then able to provide support for the seed longevity studies of the Genebanks CRP that have been of great value (see Box 1).

One significant example of strengthening links between conservation and use is at ICRISAT in its East and Southern Africa operations in Kenya, where the Evaluation Team interviewed ICRISAT staff. Genebanks CRP funds have been used to upgrade the facilities of ICRISAT’s collections there, of sorghum, millets, and pigeonpea. ICRISAT breeders actually manage the germplasm collections, and have been partnering with national scientists in the region, particularly in Kenya and Tanzania, to collect germplasm of these crops, conserve it in the ICRISAT ESA genebank, and evaluate it in farmer trials. Superior selections from these landraces have already been released to farmers for further evaluation and adoption. The Evaluation Team considers that promotion and monitoring of effective links between conservation and use across genebanks and research and breeding programs within CGIAR require continuing attention and effort.

4.2.2 External Uses

The number of countries receiving germplasm has increased as well as the number of requests from, and accessions distributed outside CGIAR, moving from 28 421 accessions in 2012 to 32 850 in 2015. However, it is not possible to attribute this increase directly to the Genebanks CRP. Nevertheless, as pointed out earlier in this report, having better and easier access to data about the availability of germplasm and its characteristics, which Genesys has brought about, is the essential first step to encourage use of a genebank collection.

The potential of FIGS should not be underestimated. The Evaluation Team believes that if genebanks adopted FIGS to select germplasm in response to external requests then the need to distribute large numbers of accessions would actually diminish. As a result of FIGS, germplasm can now be distributed in a much more targeted and effective way in response to requests, enhancing genuine use. More effective targeting of accession dissemination will have the consequence that it will be necessary to adjust reporting on distribution indicators and reconsider whether distribution figures are genuinely reflecting use.

The Evaluation Team found no evidence that external requests for germplasm had not been fulfilled, except where there was a temporary phytosanitary restriction, or insufficient material for immediate distribution; in the case of CIP there was a moratorium on the distribution of *in vitro* samples outside the center while the identity of clones was confirmed. Centers have duly complied with the requirements for distributing germplasm, concerning identity validation and legal requirements regarding phytosanitary health; compliance with the International Treaty, including SMTAs; and any local government restrictions (such as CIP's Andean roots and tuber collections that have limited distribution outside Peru).

4.2.3 Linkages with other Programs

Moving forward, the Evaluation Team is confident that there will be positive changes. Conservation *per se* still encompasses the bulk of what the Genebank Platform is expected to achieve. Both molecular characterization and pre-breeding are being addressed in the Excellence in Breeding Platform. The Big Data Platform plans to complement germplasm information with data on environmental and socio-economic aspects thus adding value. Therefore, the Evaluation Team emphasizes that even if linkage between conservation and use may have been deficient in the CRP, there is clear opportunity for the underlying deficiencies to be adequately rectified in the new Platform. It is essential that these three Platforms do not become silos with little or no consideration of, or relationship to, what is being undertaken in the other Platforms, or indeed in the Agrifood-system CRPs. The benefits from collaboration and interaction among the Platforms and CRPs can be significant and they derive from CGIAR's ability to embrace its integrative strength for germplasm use and data generation. Mechanisms must be established to facilitate dialogue and information flow between the Platforms so that the opportunities are fully harnessed.

Recommendation 10. Given that close linkages between the Genebank Platform and the Excellence in Breeding and Big Data Platforms will be essential for strengthening genetic conservation and use, the Genebank Platform Management Team should agree with the managements of the other two Platforms appropriate protocols for data exchange and use. This coordination will take advantage of

CGIAR's unique position of spanning the whole range of activities from conservation to use, and minimize the Platforms developing as silos in isolation from one another.

4.2.4 Partnerships for use

Partnerships with external organizations are the *modus operandi* for CGIAR; they existed before the Genebanks CRP and have continued. For example, GOAL workshops have provided a useful venue for national genebank scientists to interact with their counterparts in the CGIAR genebanks, and benefit from developments derived directly from the CRP. The impact of the workshops goes beyond the CGIAR genebanks. AGMs have also regularly included national partners. The Evaluation Team considers these efforts very positive, and they should be encouraged so that the CGIAR genebank partnerships are extended beyond these particular examples of national scientists attending these CRP initiatives. The Evaluation Team concludes that all genebanks need further support to strengthen collaboration with national institutes without which there is a risk of becoming insular.

In addition to what has taken place through the CRP, the Evaluation Team learned about other significant partnerships involving individual genebanks that strengthen partnerships internationally or with a Center's host country. For example, Musanet (a global collaborative framework for *Musa* genetic resources and a partnership of all key stakeholders) is a very good example of an ongoing partnership of Bioversity International with other organizations that will be expanded to include China for virus indexing. CIMMYT has established the International Maize Genetic Resources Advisory Committee. ICARDA holds annual two-day meetings with the private sector, regional genebanks, national genebanks and other organizations, and provides training and technical support within the region to other institutions with shared financial support from the CRP.

The activity of further collection of germplasm is one where partnership with national counterparts is important. The Evaluation Team heard from several center staff interviewed that their genebank collections were 'incomplete', in that some regions (and their expected agrobiodiversity) was poorly represented, if at all, in the genebank collections. The Evaluation Team is unable to comment on whether this is indeed the situation, but would urge the Genebank Platform management to carefully assess this situation, and develop a prioritized and fully costed germplasm collecting plan if any gaps are identified. Centers do not plan or undertake germplasm collecting without the consent and participation of national authorities and scientists. This has long been the *sine qua non* of germplasm exploration, and particularly since 1992 when the Convention on Biological Diversity (the Rio Convention) came into force. The ICRISAT example mentioned earlier demonstrates how such a partnership between a center genebank and national counterparts should operate and the immediate benefits it can bring to farmers in the region.

4.3 Financial sustainability

The stable and guaranteed CGIAR funding under the Genebanks CRP from Window 1 and the Crop Trust has, without question, resulted in better planning and use of resources, and the confidence of center senior managements to support genebank upgrading such as new facilities in some Centers. The evidence of this was clear. This was described very well by one of the national genebank staff members that the Evaluation Team met: "We have moved from survival mode, just keeping the

genebank alive, to planning activities for its improvement and use". This change of attitude resulted from the certainty of the longer term sustainability and from the genebank staff taking ownership of and responsibility for procedures, as well as pride, due to their involvement in the QMS and GOAL initiatives. Overall, genebank operations across all Centers have certainly improved, and secured the stability of the genebanks over the medium and long terms.

The CGIAR genebanks have enjoyed, over the past five years, an unprecedented level of financial support to upgrade their operations, and enhance the security of their important international collections. More remains to be done, but the funding promised for the Genebank Platform will see most if not all genebank constraints and bottlenecks removed over the next five years.

However, the Evaluation Team also recognizes that long-term financial sustainability is not much better assured today than before the Genebanks CRP was launched, even though the CRP was projected to reach the endowment by the end of 2016. As mentioned above (section 2.3.7), support to the genebanks from endowment funding has not grown as was initially projected. The Evaluation Team does not foresee that the endowment will grow sufficiently to fully cover genebank costs in the starting phase of Genebank Platform either.

During several interviews it was mentioned that Crop Trust and CGIAR efforts to raise funding together for the endowment were minimal during the Genebanks CRP. Today the funding environment is more challenging than when the CRP was set up. The Evaluation Team urges both organizations to work more closely and better together to achieve what is, after all, a common goal of high priority: adequate long-term funding for security of the CGIAR genebank collections. Under the current uncertain pledging environment for the endowment, CGIAR's and the Crop Trust's collaboration is essential.

The Crop Trust financial commitments foreseen in the Genebank Platform for the coming years are forecast as steadily increasing, with a matching decrease in Window 1 and Window 2 funding. In the Evaluation Team's judgment, it remains uncertain how the Crop Trust commitment to provide annual funding to the Genebank Platform will be carried out. It assumes a significant increase from the current USD 2.3 million annual contribution, which is still lower than forecast for the first year of the Genebanks CRP for 2012, to USD 6.75 million in 2017 and increasing up to USD 15.03 million in 2021. The feasibility of achieving this steady increase can be viewed as overoptimistic in the light of the actual Crop Trust funding of the Genebanks CRP. Furthermore, the full endowment is now targeted at a higher level, not only to finance core operations of international collections under Article 15 of the International Treaty, but also eventually to cover the top 25 crops listed in the International Treaty's Annex 1, and other long-term costs. Given the experience over the past five years, the Evaluation Team is doubtful about these projections that are even more ambitious than before. Some donors to the Crop Trust are unable to contribute to the endowment, and the Crop Trust has applied alternative mechanisms with some donors (such as short term contracts). The Evaluation Team recognizes the valuable and important fund raising initiatives and communications of the Crop Trust for the endowment, such as the Washington DC Pledging Conference in April 2016.

During this next phase, it is important for the Crop Trust continually to assess, in partnership with the System Management Office, the growth of contributions to the Genebank Platform, and to flag if it is unable to meet funding commitments at the agreed level.

CGIAR Fund Council and subsequently System Council have discussed the idea of a levy against the other programs and platforms as one mechanism to fund the Genebanks CRP (see section 2.3.7). The Evaluation Team considers that this needs to be part of a broader funding approach in the future, because the endowment is unlikely to yield the level of support required and high levels of CGIAR's core funding cannot be relied on over a long-term. The Evaluation Team strongly encourages the CGIAR donors together with the Crop Trust to explore alternative funding strategies to support the CGIAR crop collections.

4.4 Challenges for the Genebank Platform

The Genebank Platform builds on the achievements of the Genebanks CRP in areas of genebanks operations and performance. Furthermore, it addresses actions required from CGIAR but not sufficiently addressed during the past five years. Policy and use modules, and including upgrading of germplasm health units in the conservation module, expand the scope of the Platform beyond the Genebanks CRP, and also lie at the core of how the CGIAR centers share improved germplasm and germplasm under development. It is also important that CGIAR, as a system, engages more actively in international fora (with the International Treaty and the FAO Commission) and contributes its experience and expertise to negotiations that affect access to and use of plant genetic resources. Unless it becomes more active in this respect, there is a danger that policies will be put in place that could undermine CGIAR's freedom to use and exchange germplasm.

CGIAR has an important coordination role regarding its obligations and influence internationally, as has already been highlighted in this report. CGIAR needs to oversee that this role is fully filled at different levels of the organization. The CRP Management Team have arrived at a similar perspective independent of the Evaluation Team, and the Genebank Platform proposal already has actions planned in this respect. Nevertheless, the Evaluation Team's findings in this regard through its summative assessment are an important record that the Team puts forward to the CGIAR System to reflect on.

4.4.1 Genebank Platform governance and management

Commitment to and implementation of the specific governance model involving both the Consortium and the Crop Trust has been a weakness in the Genebanks CRP, particularly on the part of participation of the Consortium. The CGIAR governance transition has brought about significant changes among CGIAR's central governance and management structures as the Genebanks CRP came to a close at the end of 2016. This change, coinciding with the approval and start of the Genebank Platform, gives CGIAR and the Crop Trust an excellent opportunity to collaborate closely on all issues related to CGIAR genebanks. The Executive Board of the Crop Trust and the System Organization (both the System Management Board and the System Management Office) must clearly define respective governance and reporting roles, and commit to the continuing unique institutional governance of the Genebank Platform.

An Independent Advisory Committee has been proposed, being composed of four independent experts on plant genetic resources, three *ex officio* delegates from the Centers and the Executive Director of the Crop Trust. The Evaluation Team considers such a committee most appropriate and thinks that it is very important that the Committee has the expertise and standing to contribute to the

success of the Genebank Platform and to build confidence among stakeholders in the Crop Trust's oversight and management of the Platform, in accordance with the CGIAR guidelines for managing CRPs and Platforms in Phase 2. The Team emphasises the importance to include external experts who can bring independent and external scrutiny and advice that will be very important to strengthen CGIAR's relationships with external bodies. This will promote international understanding and transparency of CGIAR's stewardship of genetic resources. After all, CGIAR plays its role in conservation and use at the discretion as it were of the International Treaty, and is expected to report regularly and comprehensively to the FAO Commission. Increased external validation of this role can only be to the benefit of CGIAR and its genebanks. External membership in the governance of the Genebank Platform can also enhance CGIAR becoming better connected reaching out to its germplasm partners, wherever they are.

The Platform Management Team should ensure that the Management Team's membership is clearly defined with sufficient representation of all the genebanks, and that its Terms of Reference are clear. The Evaluation Team also considers that the management roles and responsibilities should become more strategic rather than just administrative

Recommendation 11. Given the broader mandate of the Genebank Platform compared to the Genebanks CRP, the Crop Trust Executive Board should ensure strong strategic leadership and vision for the Genebank Platform either through establishing an additional position (of a Platform Manager) to those currently described in the Platform proposal or by expanding the role of the Platform Coordinator.

The Genebanks CRP was established and implemented under an institutional arrangement that was unique because the CRP was managed by an organization independent of CGIAR, the Crop Trust. The CGIAR Reform, with the CRPs, has brought about partnerships where external organizations take part in Program core management, CRP flagships are led by senior researchers from institutions outside of CGIAR and, in the case of the Climate Change CRP, Management Team is hosted by an external institution, the University of Copenhagen. In its reforms, first introducing the Challenge Programs and then the CRPs, the CGIAR has intended to become more open to external partners. However, the level of engagement of an external organization in a lead position is quite unique. The experience from the governance and management in the institutional arrangement of the Genebanks CRP has revealed weaknesses in engagement at the high level. In the Genebank Platform going forward, the Evaluation Team sees good intention and opportunities to address those weaknesses while building on the good progress the Program has made within its mandated areas of activity. Given the particular strength of the Crop Trust in genetic resources management, it needs to be seen also as a valuable strategic partner, rather than just a manager. Overall, the Evaluation Team encourages CGIAR to use the Genebanks CRP experiences, and those from the Genebank Platform to come, to learn lessons for harnessing high level partnerships to the fullest for advancing CGIAR goals and mission.

Annex 1: List of documents reviewed

CRP related documents

CGIAR Consortium 2015 Audit report: Review of Genebanks (confidential)

CRP Annual Technical and Financial Reports (2012, 2013, 2014, 2015)

Genebanks CRP Proposal, 2011

ISPC Commentary on CRP Proposal

Genebank Platform proposal, 2016

ISPC Commentary on Genebank Platform proposal

CRP Management minutes (all meetings in 2012, 2013, 2014 2015, 2016)

CRP Achievements Matrix

CGIAR Portfolio Report

Cost to the CGIAR Centers of Maintaining and Distributing Germplasm (Costing Study)

CGIAR Consortium Board Commissioned Genetic Resources Scoping Study, 2011

Individual CGIAR Genebank External Reviews (for all 11 genebanks)

Genebank technical reports to Crop Trust (selected)

CGIAR related documents

Annual General Managers meeting – summary reports (2012, 2013, 2014, 2015)

Crop Trust Fund Disbursement Strategy

Crop Trust Executive Board meeting summaries (all meetings in 2012, 2013, 2014 2015, 2016)

Crop Trust Annual Reports (2013, 2014, 2015)

Crop Trust related documents

Crop Trust Constitution

Consortium Board meeting minutes (all meetings in 2012, 2013, 2014 2015, 2016)

CGIAR Genebanks Options Paper for FC13

ISPC Commentary on CGIAR Genebanks Options Paper for FC13

Annual Reports of the System-wide Genetic Resources Program (SGRP): GPG1 and GPG2

SGRP External Review of the CGIAR Genebank Operations

CGIAR Fund Council meetings summary records (all meetings in 2012, 2013, 2014 2015, 2016)

CGIAR System Council meeting summary records (all meetings in 2012, 2013, 2014 2015, 2016)

ISPC Comments on the Costing Study and on the Genetic Resources Scoping Study

Commission on Genetic Resources for Food and Agriculture, session reports

Global Crop Diversity Trust reports to the Commission on Genetic Resources for Food and Agriculture

CGIAR Reports to the Governing Body of ITPGRFA

Annex 2. Evaluation team member biodata

Team Leader

Michael (Mike) Jackson began his career in genetic resources in the 1970s during eight years at the International Potato Center (CIP), Peru followed by a decade on the faculty of The University of Birmingham, UK. In 1991, he joined the International Rice Research Institute (IRRI) in the Philippines to manage the world's largest genebank for rice as program leader for genetic resources and first head of the Genetic Resources Center. From 2001 until his retirement in 2010, he served as IRRI's Director for Program Planning and Communications. He has over 40 years research experience, with more than 125 scientific papers and book chapters on genetic resources conservation, evaluation and use, and biosystematics, as well as pre-breeding, agronomy, and plant pathology. He is author/co-editor of four books on genetic resources, the most recent (in 2014) about genetic resources and climate change. He has a BSc Honours (botany and geography, 1970) from the University of Southampton, and MSc (1971, genetic resources) and PhD (1975, potato biosystematics) degrees from The University of Birmingham.

Team members

Marisé Borja is Chief Technical Officer at Plant Response Biotech S.L. and associate professor at the Universidad Complutense de Madrid. She has over 30 years' experience in R&D in the Ag-Biotech sector in both US and Europe. She is an expert for the EU Commission in committees related to biotechnology, agriculture and environment for more than 20 years. She has been leading evaluator for the EU funded Genetic Resources programs. She has managed a private company germplasm collection for 15 years. She has been a Principal Investigator in more than 30 international Industry-Academia collaborative projects and has published more than 50 research papers. She has wide experience in bringing results from basic research science to the market and in IPR issues for which she was the ISF (International Seed Federation) ornamental representative at the UPOV. She has also been a Fleuroselect Board member. She has a BSc (molecular biology, 1987) and PhD (1991, genetic resources) degrees from the Universidad Complutense and an MSc (1997, bioethics) degree from the University of Comillas.

Brian Ford-Lloyd began his career in plant genetic resources under the guidance of Jack Hawkes and Trevor Williams at The University of Birmingham in the early 1970s. His career continued in Birmingham becoming Director of the MSc course in *Conservation and Utilization of Plant Genetic Resources*. At the same time his research continued on aspects of genetic resources conservation and use involving a range of crops such as sugar beet and rice. He has co-authored ten books on different aspects of plant genetic resources, 34 book chapters, and has published over 110 research papers covering molecular genetic diversity on the one hand and plant tissue culture on the other. While continuing in research Brian was awarded a Chair and moved into administration acting as Head of Biosciences at the University of Birmingham and then Director of the University Graduate School, joining the University senior Management Team. He received an Honours degree in botany (1970) and a PhD (1973, biosystematics of the genus *Beta*) from The University of Birmingham. He recently became Emeritus Professor.

Annex 3. Resource Group members

Name	Affiliation
Andreas Graner	Managing Director and Head of Genebank Department, Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Germany
Dan Leskien	Senior Liaison Officer, Commission for Genetic Resources for Food and Agriculture, FAO
Maria Jose Amstalden Sampaio	Global Policies Coordinator, Secretariat of International Affairs, EMBRAPA, Brazil
Lim Eng Siang	Previously with Ministry of Agriculture and Agro-Based Industry, Malaysia
Carl-Gustaf Thornström	Guest researcher, Department of Plant Biology and Forest Genetics, Swedish University of Agricultural Sciences, Sweden
Maureen Robinson	Independent Consultant, expert on governance and management.

Annex 4. CRP Achievement Matrix

GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
Objective 1: Crop and Tree Diversity in International Collections under Article 15 (ITPGRFA) is Secured in Perpetuity							
a. Long term and medium term storage (LTS & MTS)	Total number of accessions 692,121	Total number of accessions: 722,387 692,405 seed acc. reported	Total number of accessions: 726,166 697,354 seed acc. reported	Total number of accessions: 737,220 706,998 seed acc. reported	Total number of accessions: 749,656 717,205 seed acc. reported	To be reported in February 2017	Collection size increased rate of 0.5-1.5% year representing acquisitions from other organizations, breeders collections and collecting missions as well as introductions from backlogs. Increase in size does not necessarily correspond with numbers of phytosanitary acquisitions in any one year because of time lags as certain new introductions go through and regeneration processes before official acquisition.
	Partial data (CIP did not submit a baseline because no genebank manager in place)	2788 acc in cryo	2865 acc in cryo	2402 acc in cryo	2846 acc in cryo	To be reported in February 2017	Actual progress is hidden by the work of CIP to rationalize existing cryo collection (approx 400 acc were eliminated (this figure should be verified) due to their not reaching standards of viability and 1028 acc have been cryopreserved at CIP.
	Partial data (CIP did not submit a baseline because no genebank manager in place)	24,326 acc held <i>in vitro</i>	22,050 acc held <i>in vitro</i>	23,279 acc held <i>in vitro</i>	23,529 acc held <i>in vitro</i>	To be reported in February 2017	<i>In vitro</i> protocols for certain collections (e.g. yam, Andean root & tuber (ARTC) spp) still suboptimal. Some losses of acc still occur, which are replaced by acc from the field. Some rationalization also occurring at CIP.
	Partial data (CIP did not submit a baseline)	28,479 acc held as live plants	25,345 acc held as live plants	27,763 acc held as live plants	30,991 acc held as live plants	To be reported in February 2017	ARTC, banana, cassava, potato, sweet potato, yam, groundnut, <i>Tripsacum</i> , trees.

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
	because no genebank manager in place)						Some rationalization occurring at CIP.
	No data	48,548 acc tested for viability	67,219 acc tested for viability	99,341 acc tested for viability	82,430 acc tested for viability	To be reported in February 2017	Increase across years should be an indication of general increase in rate of operation. Ultimately it should decrease quite substantially.
	LTS (seed): 597,250 MTS (seed): 585,593	LTS (seed): 614,067 MTS (seed): 599,736	LTS (seed): 632,966 MTS (seed): 617,871	LTS (seed): 638,536 MTS (seed): 631,597	LTS (seed): 646,418 MTS (seed): 639,470	To be reported in February 2017	Emphasis from reviews has been to get seed into LTS as soon as possible in order to increase seed longevity. Various issues are being addressed in Africa Rice, CIAT, CIMMYT maize, ICARDA & ILRI to deal with backlogs to achieve this. ICRISAT are increasing their LTS & MTS capacity to improve storage in 2016.
b. Safety duplication	412,743 seed acc in safety dup	381,334 seed acc in safety dup	391,987 seed acc in safety dup	412,731 seed acc in safety dup	382,545 seed acc in safety dup	To be reported in February 2017	Decrease in 2012 because of data validation. Decrease in 2015 because of withdrawal of seed from Svalbard by ICARDA.
	6,680 clonal acc in safety dup (partial data because CIP did not submit a baseline)	16,444 clonal acc in safety dup	16,942 clonal acc in safety dup	16,355 clonal acc in safety dup	20,510 clonal acc in safety dup	To be reported in February 2017	Except for Bioversity (which duplicates its cryo collection), safety duplication in these collections involve annual exchange of <i>in vitro</i> germplasm which is fraught with difficulties and delays, or the same institute maintaining a duplicate collection in another location. Cryo is being pursued as a better alternative
	No data	12,320 acc transferred into safety duplication	10,996 acc transferred into safety duplication	4,230 acc transferred into safety duplication	7,095 acc transferred into safety duplication	To be reported in February 2017	Centers have been saving up seed to safety duplicate in one batch and an amazing 79,982 seed accessions are planned to be duplicated (according to submitted

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
							workplans) at first level or at SGSV in 2016.
Objective 2: Conserved Crop and Tree Germplasm is Clean, Available and Disseminated							
a. Regeneration and characterization	No data	15,815 seed acc regenerated	12,670 seed acc regenerated	16,674 seed acc regenerated	13,104 seed acc regenerated	To be reported in February 2017	Regeneration of accessions with low viability.
	No data	57,533 acc characterized	37,024 acc characterized	35,300 acc characterized	46,552 acc characterized	To be reported in February 2017	Within the Costing Study there is little funding available for in depth characterization. This activity is therefore generally restricted to validation of type and minimum characterization, although reported activity is also likely to relate to characterization/evaluation activities carried out in partnership with breeders and researchers outside of the CRP.
b. Disease testing and cleaning	No data	57,577 acc health tested	44,848 acc health tested	38,898 acc health tested	52,339 acc health tested	To be reported in February 2017	Dependent on capacity of germplasm health units. At IITA, the RAP helped increase GHU capacity significantly in 2015. IRRI and CIMMYT reported that they had run out of budget part way through the year to pay for the services of their GHUs.
	No data	14,943 disease cleaned	12,500 disease cleaned	12,102 disease cleaned	10,928 disease cleaned	To be reported in February 2017	
c. Acquisition	No data	30,266 reported increase in accessions from previous year	16,548 reported increase in seed collections from previous year	11,879 reported increase in seed collections from previous year	18,248 reported increase in seed collections from previous year	To be reported in February 2017	This figure only describes the overall increase in accession numbers and does not take into account any decreases occurring at the same time
	No data	13,745 acc received from collecting missions and	12,297 acc received from collecting missions and	7,984 acc received from collecting missions and	11,868 acc received from collecting missions	To be reported in February 2017	These include materials received from national genebanks through the BMGF-funded regeneration work.

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
		other organizations	other organizations	other organizations	and other organizations		
	n/a	Collecting proposals submitted at AGM and 7 selected	6 collecting workplans under way. Permission for Bioversity to collect in Myanmar not forthcoming	6 collecting workplans under way.	6 collecting workplans under way. 2544 acc collected in Bangladesh, Benin, Cameroon, DR Congo, Greece, Nepal and Nigeria)	To be reported in February 2017	
d. Multiplication and dissemination	No data	54,178 seed and clonal acc multiplied	45,450 seed and clonal acc multiplied	56,819 seed and clonal acc multiplied	60,546 seed and clonal acc multiplied	To be reported in February 2017	RAPS for some Centers in 2014 and 2015 should have supported an increase in regeneration and multiplication. This has been apparent in Africa Rice and IITA but less so in CIAT and CIMMYT, where other constraints are affecting rate of regeneration
	No data	116,766 total samples distributed	148,421 total samples distributed	123,126 total samples distributed	91,506 total samples distributed	To be reported in February 2017	
Objective 3: Use of Conserved Crop and Tree Diversity is Informed and Facilitated							
a. Managing information for accessions management and use	GRIN-Global under development by USDA with support from Crop Trust		GRIN-Global Pilot project initiated with CIAT & CIP.	GRIN-Global "Front runner", Juan Carlos Alarcon, employed at CIMMYT. (through CWR Funding) GRIN-Global Workshop for CIAT	GOAL Workshop in Cali GRIN-Global Workshop in Prague GRIN-Global implemented for wheat and maize collections at CIMMYT CIP, CIAT, ICRISAT, IITA, ILRI decide to adopt	GOAL Workshop in Ibadan GRIN-Global workshop at CIAT	Improvement of data management was recommended in almost every review and RAP. In most cases, systems were functioning on platforms that were either outdated, inadequate or soon to become inaccessible (e.g. Oracle). Six, possibly 7, genebanks are now adopting or opting to adopt GRIN-Global.

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
					GRIN-Global (Africa Rice & Bioversity undecided; ICARDA and IRRI will keep existing systems)		
		Efficiencies reported through use of mobile devices in day-to- day operations: CIMMYT (DataCapture), Bioversity, CIAT, ICARDA (Collecting forms)	Expansion in use of mobile devices and bar- coding. CIAT reported use of QR codes. ILRI introduced Bar- code systems in 2013 (using German funds)	Comprehensive bar-coding (from field to store) promoted and supported through QMS and RAPs	Comprehensive bar-coding (from field to store) promoted and supported through QMS and RAPs	Bar-coding workshop planned to take place in May with all genebank data managers in Berlin with a visit to IPK	Reports from Centers are very positive about the efficiencies brought about by bar-coding. In 2016 we plan to have a final push to enable all genebanks to be able to fully integrate and implement bar-coding in all genebank operations. It would be interesting to explore in more depth labelling error before and after.
b. Genesys	SINGER and Genesys are used to publish accession passport data. Both are operated and hosted by Bioversity International, who also host and manage the EURISCO database.	Few genebanks are updating accession-level data on Genesys. SINGER and Genesys co-exist	Genesys 1 moves from Bioversity to the Crop Trust. Matija Obreza hired as "Genesys Project Manager", work on phase 2 of Genesys begins. Bioversity engaged to provide support	Genesys 2 published in March SINGER discontinued. First fully automated mechanism for uploading data to Genesys implemented at IRRI.	Genesys software developed and website updated Linking of GRIN- Global and Genesys implemented and tested on CIMMYT databases. Passport data in Genesys up-to-date for most genebanks.	Development of Genesys is focus of Platform proposal Use Module	

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
			in development. Programming work outsourced to private sector.	ICRAF, ICRISAT data updated.			
			Genesys Oversight Committee established.			Genesys Advisory Committee established.	
			New Data Provider Agreement developed and signed between the Crop Trust and 10/11 genebanks.	Minor updates to the wording of DPA based on feedback from partners.		CIAT still to sign DPA	
Objective 4: Crop and Tree Diversity is conserved within a rationalized, cost-effective and Globalized System							
a. Developing partnerships and exchange of services	Crop Germplasm Knowledge Base (CGKB) developed in GPG2	Support for CGKB continued through CRP	Genebank managers review the continued use of CGKB.	Consultancy to review development of CGKB	CGKB archived	Developing website at Genebanks.org which will give access to QMS documents, CGKB documents, Genesys, ORT, etc.	
	n/a		Half-day workshop on crop user groups presented by USDA staff at AGM	Discussion & planning to develop crop advisory groups. Plan is to exploit opportunities rather than initiate groups across the board	Wheat Germplasm Conservation and Use Expert Working Group set up within the International Wheat Initiative	Wheat EWG meets in Rabat Maize advisory group meets in Mexico City	

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
				CRP contributes to DivSeek development through participation in meetings and discussions.	CRP contributes to DivSeek development through participation in meetings and discussions.	Genotyping workshop for 50 participants planned to share case studies on the application of genotyping data for genebank management. All CGIAR genebanks planning to attend at CIMMYT in November	
	n/a	AGM in Rome with SPC, IPK, CGN, FAO participating	AGM in Ames, USA, with large USDA participation, plus representatives from national genebanks in Brazil and Mexico	AGM in Arusha, Tanzania with participation of national genebanks of Tanzania, Zambia, Uganda, Kenya. Also had a focus on policy and phytosanitary issues with ITPGRFA and IPPO representatives leading sessions	AGM in Izmir, Turkey, in conjunction with Crop Wild Relative Project with 41 country representatives.	AGM to take place in Melbourne & Horsham in Australia	The AGMs have been vibrant meetings with a lot of useful discussion and interaction both from inside and outside the genebanks and CGIAR. These meetings bring important cohesion and collaboration and very much motor and direct the CRP forwards.
<i>b. Rationalization and optimization of collections</i>	n/a	IRRI & ILRI genebank reviews (reviewers from CGN, MSB, Bioversity, USDA)	CIAT, Bioversity & CIMMYT genebank reviews (reviewers from CGN, EMBRAPA, MSB, CIP, IPK,	Africa Rice, IITA & ICRISAT genebank reviews (reviewers from CGN, FAO, Independent experts, MSB, USDA)	CIP & ICRAF reviews (reviewers from MSB, Independent experts)	ICARDA genebank review	The reviews have been influential in the development of the targets, QMS, data management, etc. across the whole program. All reviews have been highly supportive of the genebanks, their activities and their roles.

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
			INIA-Uruguay, USDA)				
n/a	Provided optimization funds to ILRI (characterization & health testing) & IITA (adopting CIAT protocol for cassava <i>in vitro</i>)	Optimization work requested by Centers (ICRAF, ILRI)	CIAT & CIMMYT "Recommendation Action Plans" (RAPs) agreed and initiated IRRI commissions SeQso to manufacture rice seed phenotype sorting machine	CIAT & CIMMYT RAPs ongoing; RAPs agreed and initiated for Africa Rice, Bioversity, CIAT (2nd), CIP, IITA, ILRI, IRRI, ICARDA. Seed phenotype sorter shipped to and installed at IRRI	Previous RAPs still under way. RAP for ICRISAT initiated. Seed phenotype sorter shipped to and installed at IRRI	RAPs were developed to address specific recommendations from the genebank reviews. Most have objectives to strengthen QMS and data management systems. Other objectives cover a range of activities to optimize operations, increase rates of regeneration, improve capacity to remove bottlenecks in health testing, improve seed viability, etc.	
n/a			Axel Schmidt hired to bring forage community together, carry out survey and develop strategy	Bruce Pengelly takes over from Axel Schmidt to develop tropical forages strategy. Priorities developed at strategy meeting held in Bonn.	Bruce Pengelly & Birgitte Maas implement first phase of Tropical forage strategy.	More challenging than it sounds, this strategy is about trying to identify priorities in forage conservation and use from the thousands of taxa that have been conserved over the decades (following trends that have been and gone for specific traits, species or collections!!br0ken!! This group of taxa are the most expensive seed crops to conserve and for over a decade there has been a question about how to rationalize the collections and expense. This initiative is trying to address this question and bring about an agreement between the Centers involved (CIAT, ILRI, ICRAF, ICARDA, ICRISAT and IITA).	

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
	n/a		<p>ILRI decides to invest funds in reconstructing the genebank in response to genebank review.</p> <p>CIAT launches campaign to build new state-of-the-art genebank facility</p>	<p>Applied for funding for ICARDA genebanks in Lebanon and Morocco. Funding approved.</p>	<p>ICARDA built facilities at Terbol, Lebanon, and Rabat, Morocco.</p> <p>IRRI built facilities to house seed processing</p>	<p>ICARDA equipping and completing genebank development</p> <p>Crop Trust hire consultants to advise Africa Rice on plans to move genebank and build facilities in Cote D'Ivoire. Kate Gold visits Cotonou and Bouaké. Thanks to our intervention Africa Rice is now building a purpose-built building and installing new cold rooms.</p>	<p>Although several of these initiatives are not funded by the CRP, we think it is significant that they began after specific recommendations from individual genebank reviews to improve facilities. It is very positive that the Centers have responded with such strong actions to these reviews and the CRP in general.</p>
	n/a		<p>Genebank review (at CIMMYT) recommends CGIAR play more of a role in research on seed longevity</p> <p>Studies by Fiona Hay under way at IRRI funded by GRiSP</p>		<p>Initial data sampling of CGIAR genebanks viability data and presentation at IPK-organized conference in Germany</p> <p>Initiate agreement with IRRI to spearhead review of historic viability data and seed</p>	<p>Fiona Hay and Katherine Whitehouse visit Africa Rice, ICRAF, IITA, ICARDA, CIAT and CIMMYT to review historic viability data and procedures.</p>	<p>Recognising the importance of every step in seed collecting/production/processing in influencing seed longevity, as well as re-examining storage conditions, has been an important milestone in the CRP. The involvement of the genebank's national staff in events like the GOAL workshops is essential for this kind of capacity building. We have only really started on this initiative with IRRI expertise taking a lead. Some Centers are</p>

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
					<p>processing procedures across CGIAR genebanks. IRRI has difficulty hiring expertise.</p> <p>Fiona Hay presents some initial findings on seed longevity from IRRI at AGM</p>		obviously benefiting more than others. Nevertheless the complexity of seed longevity means there are surprises in there for everyone. Developing this work is a key part of the Platform proposal, not just to ensure that CGIAR are keeping high standards but to build in some genuine cost-efficiencies.
	n/a	Cryobanking strategies under development	Cryobanking strategy for CIP approved and initiated	Cryobanking strategy for Bioversity & CIP under way.	<p>Cryobanking strategy for Bioversity, CIP & IITA under way. IITA and CIP both install liquid nitrogen generating plants.</p> <p>Major achievements in improving workflow and increasing rate of successfully cryopreserving potato accessions at CIP</p>	Cryobank projects continue	Inter-Center learning in large-scale cryobanking is crucial here. Much of the above is relevant here too.
c. Establishing and updating QMS, operation manuals and staff retention plan	Institute QMS at various stages of development and relevance to genebanks	Data gathered on QMS from individual Center genebanks in ORT	Erica Benson & Keith Harding hired. They visit IITA, CIAT, Bioversity & CIP to review QMS status and needs	Janny van Beem hired (August).	Janny visited IRRI, CIAT, AfricaRice and ICRISAT	Janny visited IITA, ICARDA, CIAT and plans to visit ICRAF	QMS is core to the program. Much has already been said.

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
			Roadmap developed for QMS focussed on cryobanking	3 briefs written on labelling, job descriptions, succession planning and capacity building Overall QMS strategy developed and presented at AGM. SOP templates created for ACQ, CONS, REG, SAF DUP, DIST	GOAL workshop at CIAT with 35 participants from CIP, CIMMYT, CIAT, IRRI, CORPOICA, INIA-Peru, INIA-Ecuador and USDA QM templates were created for Safety Equipment, Succession and Capacity Building, Risk Management, Training Record and Characterization (CHA)	GOAL workshop at IITA with 45 participants from AfricaRice, Bioversity, KULueven, ICARDA, IITA, NACGRAB, NRCRI, and Egypt Genebank GOAL workshop in ICRAF planned for September 2016	
						QMS framework document for CGIAR/Crop Trust under development	
Performance Targets							
1. Availability		66%	68%	72%	57% seed	To be reported in February 2017	
2. Safety duplication		57% seed; 56% clonal	57% seed; 62% clonal	59% seed; 52% clonal	53% seed; 71% clonal	To be reported in February 2017	

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GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
3. Data availability		57%	61%	73%	87%	To be reported in February 2017	This indicator needs more work. If passport data is lacking for historical accessions, it will never be forthcoming and minimum standard descriptors for characterisation data are not particularly well established. PDCI works better as a general indication of the documentation of the collections. Whether we can increase the index towards a target (we considered a PDCI target of 6) is difficult to judge. It may be more interesting having a target only for new accessions but that will involve more complicated reporting demands. Coming up with a relevant index for characterisation data has proven challenging.
Passport Data Completeness Index					Average 5.42	To be reported in February 2017	See above
4. QMS	CIP accredited ISO 17025 accreditation	CIMMYT attained ISO 9001 certification	Decision to pursue "homegrown" genebank QMS and define minimum elements for acceptable QMS	Genebanks benchmarked with respect to minimum QMS 5 minimum QMS goals defined (SOPs, Risk management, Succession planning, Security and bar-coding)	17 SOPs completed at IRRI, CIAT, AfricaRice and ICRISAT	20 further SOPs expected to be completed and minimum elements put in place by genebanks exc CIP & CIMMYT.	

Report of the CRP Genebanks Evaluation

GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
5. Use: diversity		105 Countries receive germplasm 2,331 requests from outside CGIAR 46,589 acc distributed within CGIAR 28,421 acc distributed outside CGIAR	122 Countries receive germplasm 1,721 requests from outside CGIAR 61,325 acc distributed within CGIAR 31,022 acc distributed outside CGIAR	112 Countries receive germplasm 2,054 requests from outside CGIAR 34,769 acc distributed within CGIAR 32,556 acc distributed outside CGIAR	114 Countries receive germplasm 2,366 requests from outside CGIAR 20,010 acc distributed within CGIAR 32,850 acc distributed outside CGIAR		This is an indicator without targets. We do not necessarily want to incentivize more distribution. We do want to know that the genebanks are, however, supplying the strategic needs of primary users. This is something we would like to follow up on with more impact study type work.
6. Use: quantity		116,766 samples distributed in total	148,421 samples distributed in total	123,126 samples distributed in total	91,506 samples distributed in total		
Genebanks CRP Management							
Financial		Expenditures for routine operations USD 12,394,084	Expenditures for routine operations USD 14,467,250	Expenditures for routine operations USD 14,966,581	Expenditures for routine operations USD 14,942,884		

Report of the CRP Genebanks Evaluation

GENEBANKS CRP OBJECTIVES	2011	2012	2013	2014	2015	2016	Comments, etc.
	Costing study published in 2010	Costing study used as a basis for the CRP budget. Routine costs are provided as in the proposal as a maximum budget. Carryover is allowed. "Additional requirements" are identified through reviews, AGM and MT meetings, etc., and funded as independent projects.	Finance and Administration Committee (FAC) set up and technical and finance staff work together to set up principles and procedures, and make administrative decisions.		Work on parity with Simon Linington as a consultant. Recollected data on staff time allocations, equipment age and estimated replacement date, rate of operation. Presented at AGM and used as the basis for the Platform proposal budget. FAC also conducted a survey of Centers to ask what costs are attributed to genebanks and how they are allocated	Establishment of a task force of Corporate Services Directors to look at implementation of Financial Guidelines 5 in response. They used Crop Trust survey results as a basis for their own survey of FG5 implementation.	We will revisit staff time allocation in the following years. We also aim to conduct a Costing Study based on a steady state of operation.
			After a letter from Marie Haga to the Consortium Board Chair, agreement by CB and Center DGs in form of letter from that states CRP funds will be provided in full.		Fund Council, Consortium Board and DGs agree not to cut Genebanks budget	All funding is accounted for. Janet, Amanda and Charlotte have had calls with nearly all Center Finance Directors and Genebank Managers to confirm the budgets and that nothing will hold back the expenditure of	

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						remaining funds. We will monitor this again in July.	
Project Management	LTG managed by Crop Trust	PMIs revised to introduce quantitative indicators Online Reporting Tool developed	Indicators presented to Consortium Office & CRP leaders in Montpellier in June PMIs and 90% targets for availability, safety, duplication, documentation and QMS presented and agreed at AGM	Genebanks status with respect to targets presented at DGs & Consortium Board Chairs meeting in Tanzania. Report to CO provided as summary status report (after CGIAR portfolio report included genebanks only as a footnote)	Consultative effort between genebanks, CO and Crop Trust to develop Genebank Options paper. Paper is presented to FC13 in Bogor in April. FC select "Option 2" and agree to provide USD 93.1 million.	Crop Trust coordinated submission of pre-proposal and development of full proposal	
		Management Team of Crop Trust and Consortium Office staff set up. Two meetings held	Nine MT meetings held, of which two were open calls to the whole group of genebank managers (not including the AGM)	Management Team incorporate Executive Members of A15 Group. Six MT meetings held, of which one was an open call to the whole group (not including the AGM).	Seven MT meetings held (not including the AGM), of which three were open calls to the whole group.	Three MT meetings held so far.	

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					Crop Trust carry out survey of 126 Center DGs, DDGs, genebank managers, finance managers, reviewers and AGM participants for their feedback on the performance of the Crop Trust as Project Manager. Strongly positive response with 44% return rate and 91% responding that they were satisfied with Crop Trust performance (none dissatisfied).		
	Genebank CRP proposal approved in March. Tripartite PIA signed between CO, Bioversity and Crop Trust in November. Shortly followed by PPAs between Crop Trust and 11 Centers				CO-commissioned audit takes place. A large number of recommendations; all but 3 directed at CO. A number of good practices identified.		

Annex 5: List of people interviewed/replied to questionnaires

NAME	INSTITUTE	Title/Role
Harold Roy-Macauley	AfricaRice	Director General
Marie-Noelle Ndjiondjop	AfricaRice	Genebank manager
Etienne Duveiller	AfricaRice	DDG-Research
Ann Tutwiler	Bioversity International	Director General
Michael Halewood	Bioversity International	Policy expert
Nicolas Roux	Bioversity International	Genebank manager
Stephen Weise	Bioversity International	DDG-Research
Jonathan Wadsworth	CGIAR Fund Office	Head
Andy Jarvis	CIAT	Decision & Policy Analysis Research Area Director (CWR)
Angela Hernández	CIAT	Genebank Staff: systems analyst, documentation coordinator (senior NRS)
Arsenio Gyprius	CIAT	Genebank Staff: bean production
César H. Ocampo Nahar	CIAT	Genebank staff: head, genetic quality laboratory
Daniel Debouck	CIAT	Genebank manager
Diego Fido Gonzalez	CIAT	Genebank staff: documentation
Eliana Urquijo	CIAT	Genebank staff: administrative assistant
Geoff Hawtin	CIAT / Crop Trust	CIAT Bot Chair; Founding Director of and Advisor to the Crop Trust
Gloria Renfigo	CIAT	Director, Finance & Administration
Javier Mauricio Gereda	CIAT	Genebank staff : bean regeneration
Joe Tohme	CIAT	Agrobiodiversity Research Area Director
Luis Augusto Becerra	CIAT	Leader, Cassava Program
Luis Guillermo Santa	CIAT	Genebank staff: seed viability
Maritza Cuervo Ibañez	CIAT	Genebank staff: germplasm health
Michael Peters	CIAT	Forages program leader
Monica Lorena Vélez Tobón	CIAT	Genebank staff: <i>in vitro</i>
Peter Wenzel	CIAT	Incoming genebank manager
Ruben Echeverria	CIAT	Director General
Stephen Beebe	CIAT	Bean program leader
Robert Nasi	CIFOR	DDG-Research
Carolina Sansaloni	CIMMYT	Seeds of Discovery project
Clara Ivonne Torres Elizalde	CIMMYT	Genebank staff
Cristian Zavala Espinosa	CIMMYT	Genebank staff
Denise Costich	CIMMYT	Genebank manager (Maize)
Hans-Joachim Braun	CIMMYT	CIMMYT Global Wheat program leader
Jean-Marcel Ribaut	CIMMYT	Director, Integrated Breeding Platform
Jens Riis-Jacobsen	CIMMYT	Director of Information and Communication
Jesus Perales Escalante	CIMMYT	Genebank staff
Juan Carlos Alarcon	CIMMYT	Senior Software developer Grin Global
Kevin Pixley	CIMMYT	Genetic Resource Program director
Marcial Rivas Rodriguez	CIMMYT	Genebank staff

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NAME	INSTITUTE	Title/Role
Marianne Banziger	CIMMYT	DDG-Research
Martin Kropff	CIMMYT	Director General
Martin Rodriguez Alvarado	CIMMYT	Genebank staff
Octavio Frutero Gutierrez	CIMMYT	Genebank Staff
Paulina Gonzalez Fierro	CIMMYT	Genebank Staff
Ramiro Tovar	CIMMYT	Finance Dept.
Roaõ Quiroz Soto	CIMMYT	Genebank Staff
Sukhwinder Singh	CIMMYT	Wheat Molecular Geneticist and Breeder
Tom Payne	CIMMYT	Genebank manager (Wheat)
Viviana Espinosa	CIMMYT	Genebank Staff (senior)
BM Prasanna	CIMMYT, Kenya	CIMMYT Global Maize program leader
Victor Kommerell	CIMMYT	CRP Manager WHEAT
Alberto Salas	CIP	Genebank Staff: Genetic Resources Specialist
Ana Panta	CIP	Genebank Staff: <i>in vitro</i> conservation/ distrib.
Barbara Wells	CIP	Director General
Bettina Heider	CIP	Associate Scientist, Plant Genetic Resources Specialist
Dagmar Wittine	CIP	Program Management Officer
Dave Ellis	CIP	Genebank manager
Giovanna Muller	CIP	Germplasm health/quarantine
Guy Hareau	CIP	Impact Assessment
Ivan Manrique	CIP	Genebank staff: curator
Karla Seminario	CIP	Finance
Luis Mendes	CIP	Finance
Meredith Bonierbale	CIP	Science Leader, Global Program of Genetics and Crop Improvement
Noelle Barkley	CIP	Genebank staff: Germplasm specialist
Oscar Ortiz	CIP	DDG-Research
Rainer Vollmer	CIP	Genebank staff: Cryopreservation specialist
Rene Gomez	CIP	Genebank staff: Senior Curator
Selim Guvener	CIP	Compliance & Intellectual Assets Manager
Michael Freedman	CIP (RTB)	Scientific Officer
Sélim Louafi	CIRAD	
Irene Hoffman	Commission on Genetic Resources	Secretary
Lynn Haight	Consortium Board	Former Chair
Albin Hubscher	Consortium Office	Director, Finance & Corporate Services
Anne Marie Izac	Consortium Office	Former Chief ScienceOfficer
Elise Perset	Consortium Office	General Counsel
Peter Gardiner	Consortium Office	Science Advisor
Philippe Ellul	Consortium Office	Science Officer
Wayne Powell	Consortium Office	Chief Science Officer
Amanda Dobson	Crop Trust	Finance Office
Charlotte Lusty	Crop Trust	CRP Coordinator/Manager

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NAME	INSTITUTE	Title/Role
Janet Muir	Crop Trust	Finance Manager
Janny Van Beem	Crop Trust	QMS Manager
Luigi Guarino	Crop Trust	Director for Science
Marie Haga	Crop Trust	Executive Director
Matija Obreza	Crop Trust	Genesys manager
Michael Koch	Crop Trust	Finance Director
Paula Bramel	Crop Trust	Science Advisor
Stephan Thyan	Crop Trust	Contracts Manager
Daniel van Gilst	Donor rep	Norway
Marcellinus Beukeboom	Donor rep	Netherlands
Melle Leenstra	Donor rep	Netherlands
Philip Chiverton	Donor rep	Sweden
Renée Ankarfjärd	Donor rep	Sweden
Marcio Miranda Santos	Embrapa	
Gemedo Dalle Tussie	Ethiopia genebank	Director General and CBD Primary Focal Point
Chike Mba	FAO	Team Leader, Seed and Plant Genetic Resources, Plant Production
Dan Leskien	FAO	Senior Liaison Officer
Samy Gaiji	FAO	Head, Research and Extension Unit (AGDR), Agriculture and Consumer Protection Department (AG)
Stefano Diulgheroff	FAO	Protection Division Secretary, ITWG-PGRFA
Ahmed Amri	ICARDA	Genebank manager
Andrew Noble	ICARDA	DDG-Research
Mahmoud Solh	ICARDA	Director General
Alice Muchugi	ICRAF	Genebank manager
Bruce Scott	ICRAF	Former Director of Finance
Ravi Prabhu	ICRAF	DDG-Research
Tony Simons	ICRAF	Director General
David Bergvinson	ICRISAT	Director General
Eric Manyasa	ICRISAT - Kenya	Scientist, cereals breeding
Hari Deo Upadhyaya	ICRISAT	Genebank manager
Henry Fred Ojulong	ICRISAT	Scientist, breeding
Moses Siambi	ICRISAT - Kenya	Director, Research Program
NVPR Ganga Rao	ICRISAT - Kenya	Senior Scientist, breeding
Peter Carberry	ICRISAT	DDG-Research
Michael Abberton	IITA	Genebank manager
Nteranya Singa	IITA	Director General
Ylva Hillbur	IITA	DDG-Research
Chris Jones	ILRI	Program Leader, Feed and Forage Development
Iain Wright	ILRI	DDG-Research
Jean Hanson	ILRI	Genebank manager
Jimmy Smith	ILRI	Director General
Misja Brandenburg	ILRI	Director, Corporate Services
Preet Lidder	Independent Science and Partnership Council	Agricultural Research Officer

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NAME	INSTITUTE	Title/Role
Rachid Serraj	Independent Science and Partnership Council	Senior Agricultural Research Officer
Elena Figus	Internal Audit Unit, CGIAR	Former Auditor
Jacqueline Hughes	IRRI	DDG-Research
Matthew Morrell	IRRI	Director General
Ruaraidh Sackville Hamilton	IRRI	Genebank manager
Alvaro Toldeo	ITPGRFA Secretariat	
Mario Marino	ITPGRFA Secretariat	
Desterio Ondieki Nyamongo	Kenya Agricultural and Livestock Research Organization (KALRO)	Senior Principal Research Officer and Director - Genetic Resources Research Institute
Åsmund Asdal	NordGen	Coordinator of Operation and Management - Svalbard Global Seed Vault

In addition to the individuals listed above, team members met with staff teams in Centers (finance and genebank staff), who provided their inputs and feedback.

Annex 6. Summary of indicator reporting in Annual Reports (2012-2015)

	Indicator	2012	2013	2014	2015	2021 target
1	Total number of accessions	*	*	*	*	
2	Total number of accessions that are currently available	(*)	*	*	*	>90% of total
3	# seed accessions held in LTS and safety duplicated at two levels	(*)	*	*	*	>90% of total
4	Number of RTB accessions in cryopreservation and safety duplicated	(*)	(*)	(*)	*	>50% by 2025
5	Number of genebanks with validated facilities, procedures, standards and expertise ^a	*				
5	Stage (from 1 to 5) in QMS development ^b					4 or 5
6	Number of accessions with passport and characterization data available (online)	*	*	*	*	>90% of total
7	Number of users accessing germplasm data ^a					
7a	Average time from seed harvest to storage ^b					
7 b	Average time between tissue subculture ^b					
8	Number of countries receiving germplasm	*	(*)	*	*	
9	Number of germplasm requests	(*)	(*)	*	*	
10	Number of accessions distributed within CGIAR	*	*	(*)	*	
11	Number of accessions distributed outside CGIAR	*	*	(*)	*	
12	Total number of samples distributed	*	*	*	*	xx % of the total collection is disseminated in 10 year period
13	Average overall satisfaction of genebank users ^b					5-7
14	Average per accession cost of routine operations for seed conservation and dissemination ^a	*				
15	Average per accession cost of routine operations for RTB conservation and use ^a	*				
16	Number of accessions in Genesys	*	*	(*)	*	
17	Number users of GeneSys	*	*	*	*	
18	% genebank routine operating costs covered by Trust endowment	(*)	(*)	*	*	
18	Number of recommendations for improved genebank management and security addressed ^a	*				

^a Deleted indicator^b New indicator

* Indicator value reported

(*) Indicator value modified retroactively

Green cell – Indicator value reported

Blank cell – Indicator value not reported

Indicators in **bold** were reported on regularly

For this analysis, the Evaluation Team used the latest official versions of annual reports