"In Trust for the International Community"

Plan and Partnership for Managing and Sustaining CGIAR-held Collections

CRP RESEARCH SUPPORT

Triticum columnare, a drought-resistant wild wheat, common to Syria and Turkey © A. Melikyan of the Armenian Agrarian University

Cover image: Jim Richardson

Contents

Acronyms and Abbreviations

AfricaRice	Africa Rice Center
ART	Andean Roots and Tubers
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture, Columbia
CIMMYT	International Maize and Wheat improvement Center, Mexico
CIP	International Potato Center, Peru
CRP	CGIAR Research Program
CWR	Crop Wild Relatives
FAO	Food and Agriculture Organization of the United Nations
GPG1	Global Public Goods Project 1
GPG2	Global Public Goods Project 2
GRIN-Global	Germplasm Resources Information Network - Global
ICARDA	International Center for Agricultural Research in the Dry Areas, Syria
ICRAF	The World Agroforestry Centre, Kenya
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics, India
IITA	International Institute of Tropical Agriculture, Nigeria
ILRI	International Livestock Research Institute, Ethiopia
IRRI	International Rice Research Center, the Philippines
ISO	International Organization for Standardization
ISPC	Independent Science and Partnership Council
ITC	International Transit Centre (of banana), Belgium
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
LTS	Long term storage
MTS	Medium term storage
NARS	National Agriculture Research System
NGO	Non-Governmental Organization
OCS	One Corporate System
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PMI	Performance Management Indicators
QMS	Quality Management System
SGSV	Svalbard Global Seed Vault
SINGER	System-wide Information Network for Genetic Resources
SLO	System Level Outcome
SMTA	Standard Material Transfer Agreement
SPC	Secretariat for the Pacific Community
USDA	United States Department of Agriculture

1 Executive Summary

This proposal presents a comprehensive 5-year plan for the management as well as the secure and sustainable funding of the collections of plant genetic resources held by 11 Centers. It details a partnership between the CGIAR, the Centers and the Global Crop Diversity Trust.

Highlights of this Plan include:

FULFILLING OBLIGATIONS

- Faithful adherence to international legal obligations under the Treaty
- Global partnerships and service provision

MEETING STANDARDS

- Articulated principles and goals guiding activities and funding allocations
- Implementation of high international standards of conservation and Quality Management Systems across the Centers

ENSURING ACCOUNTABILITY AND INCREASING COST-EFFICIENCY

- Dedicated attention to efficiency and cost saving opportunities
- Mechanisms for addressing larger cross-Center scientific and budgeting issues
- Independent monitoring and oversight linked with financing
- Controls and checks over expenditures

IMPROVING LONG-TERM SUSTAINABILITY

- 5-Year funding commitment that facilitates proper long-term management
- Commitment to phase out annual funding by building the Trust's endowment to ensure true sustainability
- A significant leadership role for the Global Crop Diversity Trust

NURTURING COLLABORATION AND COMMUNICATION

- Forum for Center cooperation and for planning with NARS
- No micro-management of genebanks; minimal transaction costs
- Planning and review at a global level for individual crops

2 Statement of Objectives

The objective of this proposal 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 international scientific standards, is cost efficient, is secure, reliable and sustainable over the long-term and is supportive of and consistent with the International Treaty on Plant Genetic Resources for Food and Agriculture.

It is commonplace in proposals such as this to articulate even higher order objectives such as poverty alleviation and food security. Conserving the CGIAR collections and making them easily available to users with associated information, will not by itself reduce poverty or increase food security. Nor will it be the isolated act that ensures that crops are adapted to climate change, or can be grown in a manner that is water and energy efficient and ecologically-friendly.

It is clear, however, that conservation and availability of plant genetic resources is an absolutely indispensible prerequisite for achieving such higher order goals. The work outlined in this proposal – all too often "assumed" as a given – underpins and is essential to the activities, outputs and outcomes of a huge portion of the research undertaken in the CGIAR and beyond by other agricultural research and development organizations. The objectives of those programs, including the CRPs, should thus also be considered the objectives of this proposal.

3 Introduction

3.1 THE CGIAR AND INTERNATIONAL AGREEMENTS

CGIAR Centers hold and safeguard some of the largest, most important, most diverse, best documented and most used collections of the crops most critically important to global food security. They also have a unique history and international status that sets them apart from all others, and arguably gives their management an imperative and prominence unsurpassed by any other single undertaking in the CGIAR.

In 1994, the Centers signed agreements with FAO in which they committed themselves to holding these resources

> ***"…in trust for the benefit of the international community."***

This status was based on a formal recognition of the importance of these collections and how they came to be constituted – that they had been

> ***"…donated or collected on the understanding that [they] will remain freely available and that they will be conserved and used in research on behalf of the international community, in particular the developing countries."***

In 2001, countries adopted the *International Treaty on Plant Genetic Resources for Food and Agriculture.* Article 15 of the Treaty is devoted to the collections held by the CGIAR Centers. The Treaty explicitly reaffirms that these collections are held "in trust." Following adoption of the International Treaty in 2001, Centers separately signed agreements with the Treaty's Governing Body that brought the collections under the purview of the Treaty. Center genebanks function in a manner that supports implementation of the Treaty, both Article 15, and other articles that deal more specifically with conservation, information systems, the Global Plan of Action, etc.

Following this, in 2005, the CGIAR agreed *System Priorities*, first on the list being "Sustaining Biodiversity for Current and Future Generations." Priority 1a spelled out the goals and objectives of the CGIAR's commitment to and work with crop

GENEBANK IMPACT STORY #1

"Most of the CGIAR's documented impact has resulted from research to improve crops."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

collections and provided useful detail about what the Centers should do in exercising their international commitments to conserve and provide the diversity that is held "in trust." This document closely follows the actions agreed by 150 countries in the *FAO Global Plan of Action on Plant Genetic Resources for Food and Agriculture,* which benefitted from substantial input from the CGIAR and which, according to the International Treaty, provides an "internationally agreed framework" for activities. The Global Plan calls for a "more rational system based on better planning and more coordination and cooperation".

The Global Plan states that "Ongoing conservation of collections of plant genetic resources for food and agriculture should be secured." And it recommends that:

> ***Support should be given where appropriate to defray expenses incurred by institutions providing designated storage and related conservation and research/documentation services for other countries. This support could help to allow for all unique material to be identified, suitably duplicated, stored safely, and characterized, regenerated, evaluated, and documented."***

At its 3rd Meeting, the Governing Body of the International Treaty took the additional step of considering and endorsing the draft Fund Disbursement Strategy of the Trust (Annex 1), which the Trust's Executive Board subsequently adopted. The Strategy combined with the FAO Global Plan of Action (adopted by 150 countries and recently updated), and of course the Treaty itself provide the higher-order framework for management of the CGIAR collections foreseen under this proposal.

There is a common thread running through all of these documents. It is that the CGIAR collections are of vital global importance. They are held "in trust" for the international community under the terms of international law. There is a solemn duty, therefore, to manage these resources with a high degree of professionalism and in a sustainable manner.

Collectively the above documents provide considerable detail of direct relevance to the genebank operations of the CGIAR, and are an important tool that can be used to guide, prioritize and evaluate management and funding allocations. In general terms, and for the purposes of this proposal, one can posit that the world community calls for the CGIAR to manage the collections in a manner that:

- Conserves the unique biodiversity according to high international scientific standards and likewise makes it and associated data available in accordance with existing legal requirements;
- Promotes the development of a rational Global System for *ex situ* conservation and availability;
- Is cost effective, efficient and sustainable and that takes advantage of opportunities to work with others to maximize efficiencies and effectiveness and reduce redundancy;
- Provides substantial global benefits through its service role, not only to Center research programs but also to NARS and others, including NGOs and the private sector.

3.2 THE INTERNATIONAL COLLECTIONS MANAGED BY THE CGIAR CENTERS

As noted in the Introduction, CGIAR Centers manage many of the largest and most important collections of crop diversity in the world. When it comes to diversity, the holdings of landraces and crop wild relatives are indicative of the amount and range of diversity conserved. In NARS' collections, 12% of accessions are clearly identified as landraces, whereas in the CGIAR it is 59%. NARS' collections, on average, consist of 4% wild relatives, whereas in the CGIAR the figure is 14%. And when one considers use,

it is noteworthy that more than 90% of distributions in the Multilateral System of the International Treaty are accounted for by the CGIAR.

Center collections obviously serve as the foundation for their breeding and research and as the major source of genetic resources worldwide for plant breeders, as well as for researchers engaged in more basic biological research. Less appreciated is the fact that Center breeding and research is the conduit, a major distribution mechanism, for the diversity conserved in the genebanks. The breeding lines developed at the Centers offer a convenient and desirable package of genetic diversity prized by NARS and other plant breeders. In many cases this is the preferred mechanism for transfer of traits contained in Center collections. It is thus artificial and simplistic to consider that a CGIAR genebank only serves NARS when a package of seeds is posted by the genebank itself. The genebank is also a direct and essential partner in supplying genetic resources through the breeding programs. The improvement work undertaken by the breeding programs adds value to the collections, while being dependent upon them.

CGIAR genebanks are major suppliers of material for (non-breeding) scientific research to CGIAR and other scientists. Such research, dependent upon the genebank collections, contributes to crop improvement and use and underpins considerable basic scientific research.[1]

This is very important support to the research of the CRPs that will contribute to the CGIAR system level outcomes. A program to support the management and sustainability of the CGIAR held collections would primarily contribute to SLO2 (Improving food security). It will contribute secondarily to SLO3 (Improving nutrition and health) and SLO1 (Reducing rural poverty). These contributions to the development outcomes are mainly due to the support given to the various CRPs that depend upon plant genetic resource use. There is also an additional contribution made to SLO4 (Sustainable management of natural resources) through the conservation and use of genetic resources for forestry and agroforestry in CRP6.

CGIAR genebanks also play an important role globally in providing services to other genebanks. Because of the high standards typically found in CGIAR facilities, national genebanks find it desirable to safety duplicate their collections with them.

Table 1 shows the number of samples held by each Center, by crop.

The CGIAR undoubtedly has some of the world's premier genebanks. But, conditions can deteriorate, backlogs can develop, capital needs go unmet, and collections and services be compromised, as was noted in the External Review of Genebanks in 1995. The World Bank-funded Global Public Goods Projects (GPG1 and GPG2) addressed just such problems, most of which could be attributed to inconsistent, deficient and short-term funding. Center genebanks can be an easy target when Center funding is tight as many essential maintenance operations can be deferred. However, there is the danger, as has occurred in the past, that such deferrals extend too long with the consequent build-up of backlogs that require urgent attention. Without reliable funding, even the best genebanks face a chronic inability to plan, to invest rationally, and to manage optimally. It would be an overstatement to describe GPG1 and 2 as "rescue projects." But no one would dispute the assertion that in a properly managed and funded enterprise, such extraordinary measures should never be necessary.

---

[1] Hodgkin, T., R. Rao, et al. 2003 The Use of *Ex Situ* Conserved Plant Genetic Resources. *Plant Genet. Resour*. 1: 19-29. Resources N

TABLE 1. CGIAR CENTER HOLDINGS

CENTER	CROP	NUMBER OF ACCESSIONS IN 2009	NUMBER OF ACCESSIONS EXPECTED IN 2015
AfricaRice	Rice	20,000	21,000
Bioversity	Banana, Plantain	1,298	1,412
CIAT	Beans	35,903	38,769
	Cassava	6,592	7,137
	Tropical forages	23,140	23,140
CIMMYT	Maize including 162 *Teosinte*, 152 *Tripsacum*	27,440	33,654
	Wheat including wild *Triticae*, rye and triticale	127,689	134,979
CIP	Andean roots and tubers	1,174	1,264
	Potato	7,213	8,188
	Sweet potato	8,108	8.979
ICARDA	Barley	26,856	29,239
	Chickpea	13,462	14,257
	Faba bean	9,181	9,968
	Forage and range plants	24,606	24,606
	Grass pea	3,210	4,375
	Lentils	11,008	11,823
	Pea	6,075	6,380
	Wheat	39,762	41,747
ICRAF	Multipurpose and fruit trees	5144*	5677
ICRISAT	Chickpea	20,267	21,282
(India)	Groundnut	15,445	16,215
	Pearl millet	22,211	23,511
	Pigeon pea	13,632	14,312
	Small millets	10,235	11,623
	Sorghum	37,949	42,003
ICRISAT	Chickpea	100	100
(Africa)	Groundnut	14,020	14,020
	Pearl millet	11,389	11,389
	Pigeon pea	1,000	1,000
	Sorghum	8,565	8,565
	Small millets	1,500	1,500
IITA	Banana, Plantain	290	290
	Cassava	2,783	2,923
	Cowpea	16,629	17,747
	Miscellaneous legumes	4,346	4,612
	Maize	878	1,118
	Yam	3,360	4,724
ILRI	Tropical forages	18,291	18,291
IRRI	Rice	110,817	120,397
	Totals:	**706,424**	**756,539**

* This number corresponds to numbers of accessions under active management

GENEBANK IMPACT STORY #2

"About 60% of the food crop area planted to improved varieties is occupied by many of the approximately 7,250 varieties bred using genetic materials from the CGIAR."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

Inevitably in any "system" that involves 11 different independent components, management differences will arise with attendant budgetary implications. Standards may diverge apart from the natural differences associated with conserving diverse crops. Many but not all of these differences will be readily justifiable. Under current conditions, however, transparency and comparability of budgets and activities are not easily achieved, as rather dissimilar results from previous costing studies have demonstrated over the years.

As a manifestation of the new OCS – One Corporate System - placing CGIAR genebank operations on a more firm financial footing, with impartial leadership, fund administration and accountability, is a formula that should strengthen operations for the system as a whole, inspire greater confidence and attract more support.

3.3 THE CONSORTIUM OFFICE / TRUST COSTING STUDY OF CGIAR GENEBANK OPERATIONS

In 2010, the Consortium Office and the Trust jointly commissioned and participated in a study to document the cost to the CGIAR Centers of maintaining and distributing germplasm. The study was based on 2009 costs and was the most comprehensive effort to date to ascertain real and current genebank costs.

The exercise attempted to cost actual activities as opposed to construct an ideal budget. Annex 2 provides an excerpted summary of the methods used and limitations in costing the operations of the genebanks.

It is worthy of note that no Centers have what might be called a "genebank budget." Many major elements of their operations are not disaggregated from larger Center budget line items, for instance. And currently there is still no common method of budgeting, and only limited uniformity of what is or isn't included in genebank budgets across Centers. As a result when Centers independently presented their own genebank budget estimates in the past, they varied tremendously and inexplicably. Transparent, verifiable, and comparable costings have not been possible in the past and are not easily obtained even now. The Costing Study used information on expenditures in 2009 from the individual Centers to establish a baseline for basic on-going genebank operations.

In 2009 USD, the cost for basic, regular, recurring functions was approximately USD 15.2 million (Table 2)[2].

The Costing Study included and noted the essential nature but did not cost vital activities such as:

- Gap analysis and collecting;
- Molecular characterization;
- Development of phenotyped and/or genotyped core collections or subsets with sought-after traits (e.g. FIGS)
- Evaluating the germplasm for important traits;

[2] As explained in this document, a more complete costing of all functions would be higher.

TABLE 2. SUMMARY OF ESTIMATED CGIAR GENEBANK COSTS FOR 2011

	TOTAL REQUIREMENT		ALLOCATION SOURCES	
CENTER	**US$**	**% OF TOTAL**	**GCDT**	**CGIAR FUND**
AfricaRice	342,515	2%	0	342,515
Bioversity	970,932	6%	159,181	811,751
CIAT	2,394,585	16%	286,526	2,108,059
CIMMYT	1,165,430	8%	309,181	856,249
CIP	3,231,248	21%	200,000	3,031,248
ICARDA	1,299,908	9%	318,362	981,546
ICRISAT	2,464,419	16%	315,302	2,149,117
IITA	1,130,621	7%	212,242	918,379
ILRI	840,763	6%	84,897	755,866
IRRI	1,393,625	9%	270,608	1,123,017
subtotal	**15,234,045**	**100%**	**2,156,299**	**13,077,746**
Optimizing collections	3,800,352		0	3,800,352
Regenration project intro	1,994,564		0	1,994,564
TOTAL	**21,028,960**		**2,156,299**	**18,872,661**

(ICRAF's costing was carried out in 2011 and will be confirmed once further work is completed on the documentation of the collection.)

- Pre-breeding;
- Training and technical backstopping;
- Research on conservation methodology, reproductive biology, taxonomy, etc.;
- Development and operation of Genesys, the global information portal of genebank accessions for plant breeders
- Networking and providing international leadership and facilitation; and
- Public awareness, attendance at conferences, visitors services etc.

A few of these activities are addressed in CRPs for some crops, but there is no uniformity of treatment amongst the CRPs.

3.4 GUIDING PRINCIPLES

The international community, and future generations, deserve and require a serious and comprehensive strategy for the management of the CGIAR-held collections. These collections are simply the world's most important biological resource for agriculture.

The genetic resource collections of the CGIAR have been described as the "crown jewels" of the system. One might reasonably assume that donors will continue to support their conservation and availability. This proposal, therefore, is less about why funding is needed (though funding is obviously critical) than it is about a partnership between the CGIAR and the Global Crop

GENEBANK IMPACT STORY #3

"The estimated rates of return on the CGIAR's investment in all crop improvement research range from 39% in Latin America to more than 100% in Asia, the Middle East and North Africa."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

Diversity Trust in which both organizations collaborate to achieve the common goal of effective management and sustainable funding.

The plan outlined below provides for the professional management of these resources in a focused, cost efficient and accountable manner. And, it offers a roadmap for placing this custodianship on a permanently sound financial footing. Anything less than this inevitably increases risk and undermines the responsibility and mission of the CGIAR, in other words it does not provide a complete or lasting solution. Nor, as this proposal argues, is it conducive to best scientific practice.

Drawing upon the Trust's Fund Disbursement Strategy endorsed by the Governing Body of the International Treaty, the following assumptions should serve as principles guiding the overall administration and management of CGIAR Center genebanks and their funding:

1. An effective CGIAR conservation system must, at a minimum, be capable of carrying out a range of functions including acquisition, storage and maintenance, safety duplication, regeneration, multiplication, characterization, evaluation, documentation, distribution and promotion of the use of genetic material.
2. Existing institutions and facilities constitute the starting point. Efficiency considerations suggest that existing capacity not be duplicated where it already is accomplishing its task.
3. Activities must be firmly based on sound scientific and technical principles, to be effective, and due account must also be taken of whether the political and social circumstances in which the collection holder operates are supportive or whether instead they may actually operate to prevent the collection holder from fulfilling its obligations.
4. Increasing overall efficiency and effectiveness can be achieved through a number of specific actions such as developing common databases, reducing unnecessary duplication, achieving a better division of labor, harmonizing quality assurance standards and performance reporting, and strengthening collaboration.
5. A robust global conservation system will require and benefit from concrete participation by all relevant institutions, not just those directly involved in providing long-term storage services and not just the Centers of the CGIAR. CGIAR Centers have a role outside their walls in creating a rational and effective system for the conservation and availability of the genepools of the various crops they have prioritized.

4 Main Activities Covered by the Plan

This Plan aims to cover normal core genebank activities. As this is not a research proposal, as deliverables (conservation and distribution) are well understood and established, and because Center-by-Center and crop-by-crop accounts would be too lengthy for current purposes, we include here an overview of principal genebank activities with commentary. Table 3 provides a synthesis of the genebank objectives and outputs, together with a selection of the issues to be addressed.

OBJECTIVE 1: CROP AND TREE DIVERSITY[1] IN INTERNATIONAL COLLECTIONS UNDER ARTICLE 15 (ITPGRFA) IS SECURED IN PERPETUITY

a. Long term and medium term storage (LTS & MTS):

Seed collections are held in cold store rooms at 4-5°C (generally for working collections stored for the medium term) and minus 18°C (for long-term conservation) in each Center. The maintenance of these facilities incurs a relatively low and stable cost, mainly involving the electricity for running cooling and conditioning equipment. The long-term collection is normally accessed as little as possible. Individual accessions require regular monitoring for viability. The medium-term collection should be stocked according to demand from users, minimizing the amount of regeneration that is required. Only Africa Rice and ICRAF lack long-term storage facilities for their collections. The long-term storage of these collections is an important issue that needs to be addressed.

Of the vegetatively propagated crops, only banana (a large part of the collection) at Bioversity, a small proportion of the potato collection at CIP, and the core collection of cassava at CIAT are held in (long-term) cryopreservation. For every other crop collection, cryopreservation protocols have been refined to work on at least a range of genotypes, and the institutes are poised to start cryobanking. However, cryobanking several thousand accessions is an extremely slow and expensive process and, to date, the strategy for deciding which accessions are a priority for cryopreservation is not well-elaborated. Producing botanical seed and other options present important

GENEBANK IMPACT STORY #4

"Recent research documents a steady decline in the variability of maize and wheat yields over the last 40 years, an improvement that is statistically associated with the spread of varieties with more stress resistance."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

[1] In this proposal, we use the term "crop and tree diversity" in its broadest sense to include all crop, forage and tree genetic resources conserved ex situ and available within the multilateral system. There are algae, fungi and micro-organisms in collections, which are not included here.

alternatives to cryopreservation. These strategies will be developed, and the collections will be gradually structured according to the needs for genotypes versus allelic diversity.

Medium term storage of vegetatively propagated crops may be in the form of field or *in vitro* collection. Bonsai plants, leaf and DNA collections also exist. Each Center has a different approach to conserving the same accession in different forms and to identifying and dealing with duplicates. Given the expense of safeguarding these collections and also the potential growth specifically in these collections, a more strategic approach tailored to use will help to reduce costs and render the collection more secure and more useful.

b. Safety duplication:

Most Centers are well on the way to safety duplicating their seed collections at the Svalbard Global Seed Vault and this activity is being monitored. The Centers also ensure first level duplication at partner institutes. The main constraint to fulfilling the objective of 100% safety duplication is the availability of additional seed where accessions are difficult to regenerate.

The vegetatively propagated collections are not as efficiently duplicated. Duplication takes the form of a partially duplicated set of cryopreserved samples (Bioversity) or as a partially duplicated set of *in vitro* samples that require costly annual replacement (CIP, IITA, CIAT and ICRAF). The revised structure of these collections and the initiation of cryobanking will help to reduce the costs of safety duplication.

OBJECTIVE 2: CONSERVED CROP AND TREE GERMPLASM IS CLEAN, AVAILABLE AND DISSEMINATED

a. Regeneration and characterisation:

Regeneration is the single most costly activity of a seed genebank. Every year some accessions from the collection will be planted in the field for growing out. There are two main purposes: (1) to regenerate accessions that have fallen below 85% viability, and (2) to multiply stock that has fallen below an acceptable level for use and distribution. The costs of (2) are placed in 'Multiplication and dissemination' in order to be able to distinguish Regeneration, which is a function of the inherent longevity of the sample and the efficiency of the long-term storage, from Multiplication, which is primarily a function of the use of the collection and consequent need to replenish supplies.

According to the FAO Genebank Standards, under ideal conditions orthodox seeds have the potential to remain viable for 100 years and in most cases considerably longer in long-term storage. This being the case, regeneration intervals should be markedly longer than currently reported in the costing study, where they range from 10 to 30 years.

Regeneration is particularly costly for outcrossing crops and wild relatives, which require careful control in the field, demanding high labour, supplies and equipment costs. Given that 21% of the total non-capital costs are devoted to this operation alone, how and what is regenerated and at what frequency is an area for closer examination and review. The possibility of regenerating accessions in partnership with NARS as part of evaluation or other projects is clearly worth exploring.

As a rule, varying amounts of characterisation and evaluation may take place at the same time as regeneration, taking advantage of the opportunity of the accessions being in the field. Characterisation may otherwise be considered as a one-off activity that occurs upon the introduction of an accession into the collection. In reality, new

descriptors become available or traits for evaluation become prioritised, and the genebank may be involved to varying degrees in characterising or evaluating subsets of the collection.

The only vegetatively propagated crop collection to have been 'regenerated' in an equivalent way as the seed collections is the banana collection at Bioversity. Subsets of the *in vitro* collection held at the ITC in Belgium were sent to five NARS field collections for planting out and checking for trueness-to-type. This costly exercise has been ongoing for more than five years and the data are still being analysed. In fact this type of 'regeneration' may prove unnecessary given the increased sense of confidence in *in vitro* culture and the lack of evidence for mutation occurring at a higher rate *in vitro* than in the field.

Nevertheless, there is a need to rejuvenate tissue culture as the plantlets become weak and require more frequent subculture. In Bioversity this is achieved through a greenhouse grow out every ten years. In CIP and IITA the renewed material is taken from the same accessions in the field collection. The accessions are generally not rejuvenated at CIAT. Again this illustrates an evolving situation where experiences and practices may be shared across Centers, and where services could potentially be exchanged and costly or *ad hoc* activities should be monitored.

b. Disease testing and cleaning:

As with information management, this is a relatively rapidly changing area of operation as the importance of pathogens change, as well as the methodology for their detection and eradication. Costs vary markedly. Every crop and Center has a different regime for pathogen testing and cleaning. Some test and clean (or destroy) upon entry and/or exit. Some require testing after regeneration too. Some materials are not tested or cleaned at all and, thus, remain unavailable for distribution.

In the seed collections, testing and cleaning is usually the responsibility of the Seed Health Unit within the Center, and costs are charged at a pro-rata rate. The costs of disease-testing and cleaning is relatively high for vegetatively propagated crops, ranging from US$ 88 to US$ 458 per accession. Protocols and procedures are still evolving for several crops. Less than 10% of the yam collection at IITA is disease-indexed while the protocols are being developed.

c. Introducing new accessions:

The status of each crop collection is highly varied in terms of its global and genepool coverage. There is no one collection that covers the entire crop genepool and all have strong regional biases. Crop wild relatives have been highlighted for their relative paucity in collections and efforts are under way to improve their representation. IRRI and CIMMYT wheat collections are not likely to grow substantially. The tropical forage collections in CIAT and ILRI are expressly not attracting new accessions because there is limited capacity to manage further diversity in these complex collections and many of the species are not included in Annex 1 of the ITPGRFA. The IITA yam and CIP sweet potato collections, by contrast, are likely to grow significantly as gaps in the collections are filled. Most collections are in the process of receiving several thousand safety duplicated accessions from NARS as part of the 5-year Trust-funded regeneration work. This project achieved an important objective of rescuing unique accessions in NARS collections, involving 246 collections in 77 countries worldwide. We, therefore, have some grounds for assuming that the majority of new accessions will come from collecting missions.

To estimate the costs of introducing accessions a level rate of 1% acquisition per year was used in the costing study for all collections except tropical forages and IITA

bananas. The real rate of acquisition is likely to be highly variable. The costs were calculated taking into account the operations undertaken at or after introduction, including quarantine, health testing and regeneration as necessary. This is, therefore, a highly costly activity.

The implications of an increasing proportion of crop wild relatives in Center collections should also be carefully reviewed on a case-by-case basis. Wild species are notoriously difficult to regenerate for various reasons and sometimes unorthodox in their conservation behaviour. IRRI is the only Center to have attempted to disaggregate the costs of conserving wild and cultivated forms. Their estimates suggest that the per accession costs for conserving wild rice are roughly 9 times those of cultivated rice. Research on germination behaviour, investigating the potential for cryopreservation or, in some cases, designating other expert institutes to conserve wild species (e.g. the Millennium Seed Bank) are all important considerations for the Center collections in this context.

d. Multiplication and dissemination

Rates of dissemination of germplasm from the genebank are highly variable and dependent on multiple trends that are difficult to predict. Recently there has been a trend for countries to request the Center genebanks to send thousands of accessions in order to populate newly built national genebanks. The costing study used 3 levels of dissemination corresponding to frequent, regular and rare uses of the collection. Some collections have very low rates of dissemination (e.g. IITA banana, cassava and cowpea collections, CIP Andean Roots and Tubers (ART) and CIAT tropical forages) while others are distributing the equivalent of the entire collection every two or three years (e.g. Bioversity, ICARDA collections).

The costs of dissemination should be calculated taking account of the needs for multiplication as mentioned above under 'Regeneration and characterisation'. Monitoring the process and rate of dissemination will be important to provide users and donors with an indication of the real costs of genebank services and of potential cost recoveries. The use (or lack of use) of the collection also informs the process of organization of the collection.

OBJECTIVE 3: USE OF CONSERVED CROP AND TREE DIVERSITY IS INFORMED AND FACILITATED

a. Managing information for accessions management and use:

Every genebank has to meet the challenge of managing accession data for at least two major objectives: (1) to manage the collection appropriately, and (2) to ensure the potential use or value of the individual accessions is made evident. In each Center, different information systems exist to cater for these needs. Some Centers have developed barcoding or other labelling mechanisms to improve accession management. While digital imagery, mapping, online tools, and the increasing quantity and quality of characterisation and evaluation have enhanced accession identification and use. This is an activity, therefore, that continues to exhibit notable system-wide increases in costs. However, in general it can be said that investments in this area are consistent with the goal of increasing future use both of the databases and the germplasm.

GENEBANK IMPACT STORY #5

"Research to maintain resistance to a single major disease of wheat — leaf rust — generated benefits from 1973 to 2007 that are currently worth $5.4 billion."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

b. Genesys:

Genesys is the new global accession-level information system. It both extends and replaces SINGER, the information system that applied solely to CGIAR collections. Developed in the CGIAR, Genesys already provides access to data on 2.3 million accessions held in 356 collections, facilitating data exchange and cross-searching. Users can search across all this material for combinations of passport, characterization, evaluation and climatic descriptors, and request the resulting material from the appropriate genebank. Work is planned to add to the evaluation data, and bring new national and regional genebanks on board as partners, as are improvements to the analytical functionality of the site. SINGER will now be phased out, and Genesys will become the world's window to the international collections and beyond to national and private collections. It will be the central component of the information system of the International Treaty.

OBJECTIVE 4: CROP AND TREE DIVERSITY IS CONSERVED WITHIN A RATIONALIZED, COST-EFFECTIVE AND GLOBALIZED SYSTEM

a. Developing partnerships and exchange of services

There are many partnerships, evident or obscure, influencing the management of the Center genebanks. What is clear is that the use and in some cases the long-term conservation of the germplasm is dependent on sustainable partnerships. Some Centers actively seek closer partnership with institutes for certain services, while others are clearly working in relative isolation. Bioversity's networking *modus operandi* has shaped one extreme where disease-indexing, disease-cleaning, field characterisation and verification, molecular characterisation and cryopreservation are all outsourced to expert institutes, and links with NARS are global and strong. In a different context, IRRI recently announced the partnership with BGI for the genome sequencing of a large number of accessions from the genebank, and in another example, any kind of work any CGIAR Center might want to pursue in the Pacific region is sure to involve the Secretariat of the Pacific Community.

In summary, there is a clear need for coordination and partnership within and outside the CGIAR, especially for particular objectives such as ensuring the conservation of the entire crop gene pool and crop wild relatives, regeneration of difficult crops, cryobanking, molecular characterisation, evaluation, information management, etc. Such partnerships may take the form of bilateral relationships between same-crop collections, or between crop collections and expert institutes or NARS, or of multiple Center/institute initiatives. The development of Crop Conservation Strategies helped bring together the community of conservationists, experts, breeders and users within each crop to define priorities for partnership, research and conservation. It is in this global system context that the existing partnerships need to be strengthened and new ones built.

The actual activities carried out will focus steadfastly on the objectives of developing a more efficient, rationalised system of conservation, and will include:

- An annual meeting of the Center genebank managers together with major non-CG partners
- Travel of genebank staff
- Strategy and proposal development
- Publication and sharing of protocols, procedures, best practices.

In addition, the Crop Genebank Knowledge Base will be maintained and periodically updated (mostly by the Centers) as a resource for genebank managers to provide easy access to crop specific knowledge and best practices for genebank management, as well as publications and training manuals.

b. Rationalization and optimization of collections

This proposal has a strong basis in the Costing Study, but while the Costing Study identified various aspects of genebank operation that require review or investment, the measured costs were limited to routine operations. No attempt was made to identify and cost comprehensively the miscellaneous activities that are necessary to rationalize and improve the efficiency and effectiveness of operations. This proposal presents the operation of the genebanks in its entirety and in the context of working towards shared long-term objectives. It, therefore, includes collective operations and efforts to ensure long-term efficiency and sustainability. These are included in the paragraphs above under each individual operation. In addition, some of these genebank activities have been elaborated in the CRPs, most particularly CRP 3.4 on Roots, Tubers and Bananas, which lists numerous 'Products' that involve improved conservation methods and procedure, elimination of duplicates, harmonization of collections, data or roles, etc. These Products accepted under CRP 3.4 are particularly relevant to vegetatively propagated crops because of the high conservation costs involved, but they apply to all crop collections.

In summary, the rationalization and optimization of collections will involve individual and/or collective efforts within individual or groups of crops to:

- Eliminate unnecessary forms of duplication within and between collections, whether it is in accessions or operations;
- Improve and refine conservation methods and procedures to optimize the duration of long-term storage and minimize the need for viability testing, regeneration, health testing and general management;
- Focus upon and determine the appropriate procedure for dealing with difficult-to-conserve accessions or costly operations. This may mean reducing the occurrence of such accessions or operations to a single rather than multiple Centers or commissioning the services of a more appropriately positioned partner to undertake certain work;
- Restructure and/or rationalize collections based upon results delivered through research efforts in other CRPs (e.g. genotyping, phenotyping, etc);
- Harmonize information on accessions together with the software to manage it and make it publicly available across Centers;
- Exploit the geographical spread of the Centers and their partnership to improve the outreach and services of individual genebanks at a global level.

These activities should improve efficiency and effectiveness, and some will result in cost savings, though initial investments will be required to reap medium and long-term savings. Priorities for support will be determined through the process of review of the individual 5-year strategic plans of the genebanks, through individual genebank reviews and through the Annual Meeting.

c. Establishing and updating QMS, operation manuals and staff retention plan

All genebanks are striving to apply international standards and best practices in conserving crop diversity. CIMMYT and IRRI have implemented Quality Management Systems at considerable cost. CIP have achieved ISO accreditation status. QMS, once established, require a recurrent investment of time and resources. To some extent, the gathering of reference information and closer monitoring of practices, operations and costs, as proposed here, will contribute to the more formal establishment of QMS. In any case, the ultimate aim is for all Centers to establish and refine QMS at an appropriate rate.

5 Non-Recurring and Irregular Strategic Program Elements

The Consortium / Trust Costing Study identified costs *only* for standard, predictable, core recurring activities occurring at each Center. It identified non-recurring items, items that were multi-center by nature, and items which were inherently "expandable" and for which no cost could be fixed without a decision about its priority, but it did not cost these. It was, after all, a costing not a budgeting exercise. This proposal, however, is the latter and thus it must include provision for such elements.

The first proposal to the Fund Council (for 2011 funding) was for $21 million, of which $2.1 million was being contributed by the Trust, leaving $18.9 million outstanding. Aside from the aforementioned excluded items, this figure also did not account for funding for ICRAF. The Fund Council approved $15.2 million for maintenance and distribution of the genebanks and took "on advisement" the costs for "one-time activities." The ISPC, it should be noted, endorsed the estimates made both for the core operating costs and the one-time costs.

These Strategic Elements are encapsulated in the Objective 4 (Table 3) and involve the global role and partnership of the Center genebanks and their strategies to ensure better and more cost-efficient conservation of the crop gene pool, as well as the documentation and implementation of international standards.

TABLE 3. SUMMARY OF THE GENEBANK OBJECTIVES AND OUTPUTS AND ISSUES TO BE ADDRESSED

OBJECTIVES	OUTPUTS	ACTIVITIES INVOLVED		ISSUES & EXCEPTIONS
		SEED CROPS	VEGETATIVELY PROPAGATED CROPS	
1. Crop and tree diversity in international collections under Article 15 (ITPGRFA) is secured in perpetuity	a. Long term (LTS) & medium term storage (MTS)	Routine maintenance of cold rooms and monitoring viable stock	Routine maintenance of cryopreserved accessions (Bioversity, CIP & CIAT), field and *in vitro* collections	AfricaRice and ICRAF have no LTS facilities; Strategies and protocols for viability testing and regeneration to be revisited in some cases; Cryobanking to be planned and/or completed for all vegetatively propagated crops; Duplication in medium term collections in CIP, IITA, CIAT, & Bioversity to be reviewed in the light of cryobanking strategy
	b. Safety duplication	Duplication of viable accessions at another genebank (first level) and in Svalbard Global Seed Vault (second level)	Duplication of cryopreserved accessions (Bioversity) and/or *in vitro*/field collection (CIAT, IITA, CIP)	More efficient and less costly safety duplication desirable instead of *in vitro* black box
2. Conserved crop and tree germplasm is clean, available and disseminated	a. Regeneration & characterization	Growing out and characterization of accessions from LTS that have declined in viability	Regular renewal of aged tissue cultures by growing out	FAO Genebank Standards promote longer duration of orthodox seeds in LTS. Regeneration rates and LTS efficiency need to be monitored in this context; Some accessions cannot be regenerated with current facilities (CIMMYT, ICARDA, ICRISAT) and wild species are very costly to regenerate. These points merit review; Needs (or lack thereof) for regular verification of trueness-to-type and field characterization in tissue culture collections should be reviewed.
	b. Disease testing & cleaning	Testing and in some cases cleaning of diseases at the Center Germplasm Health Unit for accessions entering and/or leaving the cold rooms or growth chambers		For IITA, Bioversity, CIP, ILRI and possibly others, testing procedure still being established. Diseased accessions remain unavailable in IITA, CIP, Bioversity, ICRISAT, ICARDA, ILRI and possibly other genebanks.
	c. Introduction of new accessions	New accessions are fully integrated into the collection to fill gaps in the coverage of the genepool. A full cycle of regeneration, characterization and health testing, or introduction into tissue culture and cryopreservation is usually required		CIMMYT wheat and IRRI rice, tropical forage collections not expected to increase substantially in accession numbers. Other collections have larger gaps (e.g. CIP sweet potato, IITA yam); All collections require better representation of crop wild relatives - the most appropriate location and methods to conserve these accessions should be reviewed on a case-by-case basis; The introduction into the genebank of breeders' materials and genetic stocks and an analysis of costs to be assessed.
	d. Multiplication & dissemination	Provision of samples of accessions as requested. Where necessary multiplying samples to ensure appropriate levels of MTS stock are maintained		'Multiplication' will be distinguished from 'Regeneration' so that a more accurate cost of dissemination services can be determined; The rate of use of collections should be reviewed.

OBJECTIVES	OUTPUTS	ACTIVITIES INVOLVED		ISSUES & EXCEPTIONS
		SEED CROPS	VEGETATIVELY PROPAGATED CROPS	
3. Use of conserved crop and tree diversity is informed and facilitated	a. Managing information for accession management and use	Maintaining, improving and expanding datasets for management of accessions and for promoting their use		Linking to or incorporating data from other databases or data sources
	b. GENESYS	Uploading and updating of data in the global portal for accession-level data.		Development and expansion of software and partnerships
4. Crop and tree diversity is conserved within a rationalized, cost-effective and globalized system	a. Developing partnerships and exchange of services	Partnerships built and strengthened to create a strong global system of support and role-sharing		The scope and nature of the global roles of different genebanks and partnerships between them continue to be explored.
	b. Rationalization and optimization of collections	Strategies to be prioritized and implemented relating to issues raised within all operations (e.g. improving conservation procedure, structuring collections, sharing of clear roles between same-crop collections)		Cost-effectiveness will be underlying principle in determining or prioritizing strategies; Important linkage with planned activities in CRPs.
	c. Establishing and updating QMS, operations manual & staff retention plan	Establishing and maintaining the QMS		IRRI & CIMMYT have implemented a QMS; CIP have ISO certification.

6 Interactions with CRPs

The objectives of this proposal align closely with CRPs 3.1 – 3.7. There is also some linkage with CRP 6 and the *ex situ* conservation of trees at ICRAF (see Annex 3). The conservation and distribution of crop plant genetic resources may or may not be stated as a distinct objective in individual CRPs but in all cases except one (CRP 3.5: Grain legumes, which includes outputs for the conservation of newly-acquired accessions, distribution and training), the routine operations of the genebank are not included in the budgets of the CRPs. In CRP 3.3, 3.4 and 3.5, there are outputs or product lines that are included in Objective 4 in this proposal (e.g. conservation and technology research, data management, collecting and the global role of the genebank). Evidently some coordination is required specifically with these CRPs to avoid duplication and ensure that these CRP outputs feed into the activities under way under the framework of CRP (research support).

GENEBANK IMPACT STORY #6

"By the end of the 1990s, the wide adoption of improved cassava with a 50% advantage over the average yields of traditional varieties had made possible the additional production of 10 million tons of fresh roots per year — enough to provide 14 million people with 2,200 kilocalories per day."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

The genebank managers are in a key position to provide coordination between the CRPs and the CRP (research support). CRP leadership will be invited to annual meetings where issues of close mutual interest are the focus of discussion. The genebank managers also play a pivotal role in promoting the use of the collections and in ensuring that the outputs of the CRP (research support) have the desired outcomes and impact. Impact pathways vary according to individual crops, with Center and NARS breeding and research programs playing roles of prominence. One of the most tangible links in this pathway is provided by effective information systems and in particular, GENESYS. The management structure of GENESYS was discussed and is being developed within a group of CGIAR and non-CGIAR Center genebank managers, information specialists and breeders.

7 Partnerships

Developing partnerships is an integral part of the CRP (research support) proposal and is specifically described under Objective 4.a. Partners have an essential role in providing services and assisting genebanks to achieve their intended outputs, whether it is providing essential services such as hosting safety duplicates (e.g. SGSV and other major genebanks) or jointly developing improved protocols, tools and data management software (e.g. Katholieke Universiteit Leuven, USDA), or covering the conservation of specific parts of the crop genepool that may be absent from CGIAR genebanks (e.g. SPC, USDA).

Partnership must also be nurtured with great care to ensure that genebanks achieve their intended impact. This relates to efforts to promote the use and inform users of the value of materials in the genebanks, working with breeding and research programs in CGIAR Centers and NARS to broaden the genetic base of improved materials and in certain cases providing the source of clean planting materials directly to NARS and other national or local organizations. A list of essential partners is provided in Table 4.

TABLE 4. ESSENTIAL PARTNERS CONTRIBUTING TO MANAGING AND SUSTAINING CGIAR-HELD COLLECTIONS

ESSENTIAL PARTNERS FOR GENEBANKS TO ACHIEVE INTENDED OUTPUTS	ESSENTIAL PARTNERS FOR GENEBANKS TO ACHIEVE INTENDED IMPACT
• Global Crop Diversity Trust • 11 CGIAR Centers • Svalbard Global Seed Vault (SGSV) • Secretariat of the Pacific Community (SPC) • United States Department of Agriculture (USDA) • Non-CGIAR genebanks hosting safety duplicates • Research organizations providing services for plant health, cryopreservation research, etc.	• Breeding programs in CGIAR Centers and NARS • Research programs in CGIAR Centers and NARS • Other NARS programs and organizations providing materials ultimately to farmers

8 Monitoring and Evaluation

The Trust already has in place a monitoring and evaluation system for its current long-term grants to Centers. Through the use of various project funds, the Trust has also convened meetings of grantees including genebank managers in different contexts. These existing mechanisms will be consolidated and slightly modified to accommodate the monitoring of additional funds. The four main management tools are as follows:

a) Five-year workplan

Centers will be asked to submit a 5-year master plan and budget to the Trust. This document will provide an overall strategic vision for the work and workplan of the genebank, including an outline of basic routine operations, efforts to address backlogs, collaborations and projects working towards improved conservation and use. On this basis, the Centers individually will discuss their long-term management strategy and budgetary requirements with the Trust. This discussion will provide an opportunity to explore assumptions and strategies, question approaches, and identify potential areas for change and improvement, and synergies with other genebanks. Tentative approval in principle will be given (or not), enabling the Centers to proceed with a basic understanding of the funding that will be available for a given set of activities.

b) Annual workplan and report

Annually in the first quarter of the year, the Centers will submit the report for the previous calendar year and a workplan for the forthcoming year to the Consortium Office and the Trust. This information will describe main activities, progress towards targets and standards, accomplishments, and obstacles, and will document use of funds. The Performance Management Indicators (PMI) provides the framework for all workplans and reports. The current indicators were derived from several years of consultation and revision, and are listed in Table 5. They are focused on basic genebank operations and the global role of the genebank. Some minor modification and expansion is needed to accommodate the objectives of optimizing and rationalizing collections. The annual review of the workplans and reports provides an occasion for modest adjustments to plans and budgets, and alignment with other Centers and evolving standards.

TABLE 5. CRP (RESEARCH SUPPORT) OUTPUT INDICATORS AND TARGETS

OBJECTIVES	OUTPUTS	OUTPUT INDICATORS/PMIS	TARGET[1]
a. Crop and tree diversity in international collections under Article 15 (ITPGRFA) is secured in perpetuity	a.1 Long term (LTS) & medium term storage (MTS)	a.1.1 % of seed accessions stored under LTS a.1.2 % of vegetative accessions stored in cryopreservation a.1.3 % of vegetative accessions stored under in-vitro a.1.4 % of vegetative accessions stored under in field a.1.5 % of seed samples requiring seed viability testing, according to annual plan a.1.6 Facilities/equipment meet long-term storage standards	100% accessions conserved under LTS following international standards Targets for MTS vary by crop 100% accessions are viable and true to their documented identity according to limits set by international standards
	a.2 Safety duplication	a.2.1 % of seed accessions safety duplicated in an off-site storage facility a.2.2 % seed accessions stored at Svalbard	100% accessions are safety duplicated in an off-site storage facility and at Svalbard
b. Conserved crop and tree germplasm is clean, available and disseminated	b.1 Regeneration, characterization & processing crop collections	b.1.1 Are there accessions held in-vitro that are in need of being planted out and checking for trueness-to-type? If yes, what % of the in vitro collection? b.1.2 % of seed requiring regeneration to restore viability, according to annual plan b.1.3 % of accessions for which at least half of the standard minimum descriptor set has been recorded.	100% accessions are fully characterized using standard descriptors The stocks in LTS are adequate to ensure long term conservation needs are satisfied
	b.2 Disease testing & cleaning collections	b.2.1 % of accessions free of quarantine high risk pathogens	100% distributed accessions are free of high-risk quarantine pathogens
	b.3 Introduction of new accessions	b.3.1 Number of new accessions acquired	The crop genepool is comprehensively conserved in collaboration with partner international genebanks
	b.4 Multiplication & dissemination	b.4.1 Number of new germplasm recipients b.4.2 Number of germplasm recipients of different categories b.4.3 What % of external, legitimate requests for germplasm were you able to meet? b.4.4 For those not able to be met, what were the main constraints for the unavailability of germplasm? b.4.5 Number of samples distributed outside the host institute	The stocks in MTS are adequate to respond to users' needs 100% legitimate requests are fulfilled successfully within an agreed time period

OBJECTIVES	OUTPUTS	OUTPUT INDICATORS/PMIS	TARGET[1]
		b.4.6 Number of distinct accessions distributed outside the host institute b.4.7 Number of new/different accessions distributed outside the host institute b.4.8 Number of countries distributed to b.4.9 Response rate (%) & average rating from customer satisfaction surveys	
c. Use of conserved crop and tree diversity is informed and facilitated	c.1 Managing information for accession management and use	c.1.1 % accessions passport data c.1.2 % characterization data c.1.3 % evaluation data c.1.4 % for which at least 20 microsatellites have been recorded	100% passport, characterization and evaluation data are of acceptable quality and electronically available
	c.2 GENESYS	c.2.1 % of accessions in your collection with minimum passport, characterization and evaluation data on the web and available to Genesys global portal	100% data on all accessions accessible through Genesys
d. Crop and tree diversity is conserved within a rationalized, cost-effective and globalized system	d.1 Developing partnerships and exchange of services	d.1.1 Number of leadership actions the genebank has taken that further the implementation of the relevant global crop strategy d.1.2 Number of coordination and/or networking mechanisms the genebank is involved in with regard to PGR conservation and use d.1.3 Number of people trained d.1.4 Number of institutes to whom you have provided technical backstopping activities and describe key activities d.1.5 How many institutes requested your institute to provide safety duplication services? d.1.6 How many requests have been made for any other conservation services from external institutes	The global crop conservation system is strengthened All developing NARS long-term conservation service needs are addressed Genebanks are in active communication on a global scale
	d.2 Rationalization and optimization of collections		Cost-efficiencies result in no overall increase over the 5-year period despite the increase in accessions conserved and distributed.
	d.3 Establishing and updating QMS, operations manual & staff retention plan	d.3.1 Active progress towards implementing a QMS d.3.2 Human Resources management plan d.3.3 Staff succession plan d.3.4 Staff performance appraisal plans d.3.5 Risk management plan d.3.6 Germplasm management procedures manual	All Center genebanks are functioning within the framework of regularly updated QMS

1 These are long-term targets. Their complete achievement in the next five years would demand a considerably larger budget than is proposed here. In particular for vegetatively propagated crops it is not feasible to cryobank 100% accessions within a five-year time period. Furthermore rationalization of the collections and refinement of protocols are required in order to achieve such targets in a rational manner. Nevertheless these ultimate targets should continue to guide the annual workplans.

c) Annual meeting of the genebanks

The CRP (research support) Management Team will convene an annual meeting of genebank managers, senior management and relevant CRP Leadership, including key non-CGIAR, Global System partners and the Consortium Office. The meeting provides an opportunity to foster communication and cooperation on technical and policy matters, and to consolidate standards and strategies at a truly global level.

A special session will be held to present the outcome and recommendations of genebank reviews that have taken place in the previous year with the specific aim of ensuring that common issues, constraints and successful practice are shared, and difficult issues are resolved in an open and expert forum. A thematic Taskforce will be established to explore options for addressing specific and significant issues and to develop an appropriate collective proposal. The annual meeting will provide a forum for discussion of these.

During the coming 5-year period, issues to be addressed should include, *inter alia*: (a) an effort to examine regeneration practices and the efficiency of long term storage, especially where crops are held by more than one Center, (b) a thorough review of the organization of vegetatively propagated crop collections. This work is strongly linked and, to some extent, dependent upon conservation research and technology development that is under way under the Roots, tubers and bananas CRP, and (c) development of QMS or the full documentation of implemented technical and administrative standards and procedures in all Center genebanks.

GENEBANK IMPACT STORY #7

"Improved varieties of cowpea, which provide both food and livestock feed, are being widely adopted in the dry savannas of West Africa, with estimated benefits of from US$299 million to $1.1 billion expected to accrue from 2000 to 2020."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

The Trust will work with the Consortium Office to identify and "package" relevant Consortium-level policy issues that arise at this meeting and during the year for forwarding to the Consortium Board for their disposition.

d) Genebank review

During this 5-year period, each of the Centers will undergo one thorough external review. Review teams will comprise an independent genebank expert and a crop expert, and will be serviced by a Trust staff member to promote a uniform approach and ensure communication. These reviews will provide the occasion for identifying and contending with major issues of science, strategy, management and costs at the Center level. Discussion of any substantial changes to operations would typically take place through this review process. The results of each review will be presented and discussed at the annual meeting

9 Timeline

The timeline of the main management elements is provided in Table 6. Note that this schedule includes SPC, a long-term grantee of the Trust and a key player in the Global System in regards to several crops (costs for this element are completely borne by the Trust).

TABLE 6. TIMELINE OF MAIN MANAGEMENT EVENTS

Mechanisms for monitoring & oversight	2012 QUARTERS				2013 QUARTERS				2014 QUARTERS				2015 QUARTERS				2015 QUARTERS				Participants
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Annual PMI & financial report for previous year forthcoming year's workplan & budget																					All grantees
Report approval and disbursement																					Trust
5-year review	A		B		C		D		E		F		G	H	I		J		K		2 or 3 grantees per year
Annual meeting				M			M				M				M				M		International genebanks
Development of cost-saving proposals							$				$										All grantees & partners

10 Management and Governance Arrangement

The international community and future generations require a comprehensive strategy for the management of the CGIAR-held collections. These collections are the world's most important biological resource for agriculture. The governance and management plan outlined below provides for the professional management of these resources in a focused, cost efficient and accountable manner. And, it offers a roadmap for placing this custodianship on a permanently sound financial footing. Anything less than this inevitably increases risk and undermines the responsibility and mission of the CGIAR, in other words it does not provide a complete or lasting solution. Nor, as this proposal argues, is it conducive to best scientific practice.

The CRP (research support) proposal capitalizes on the Trust leadership to secure long-term funding for the CGIAR collections as part of a global system. The Trust does not manage any collection directly as part of its role and thus does not have a conflict of interest with the Centers in managing the overall CRP (research support). This is unlike the 'Lead Center' for the research CRPs. Thus the Trust can take on the role of overall management in a neutral manner and is currently doing this through its long-term 'in-perpetuity' grants that complement the funds being requested from the Fund Council. Currently, the Trust has bilateral contractual arrangements with individual Centers to support the long-term conservation of specific crop collections. The Trust manages the performance of these contracts using similar approaches as proposed here (i.e. annual workplans, budget reports, performance indicators, external reviews and annual meetings). Thus the management approach is built upon two components, the Trust as overall manager for the CRP (research support) in partnership with the Consortium for program performance, and the Centers as managers of their individual collections.

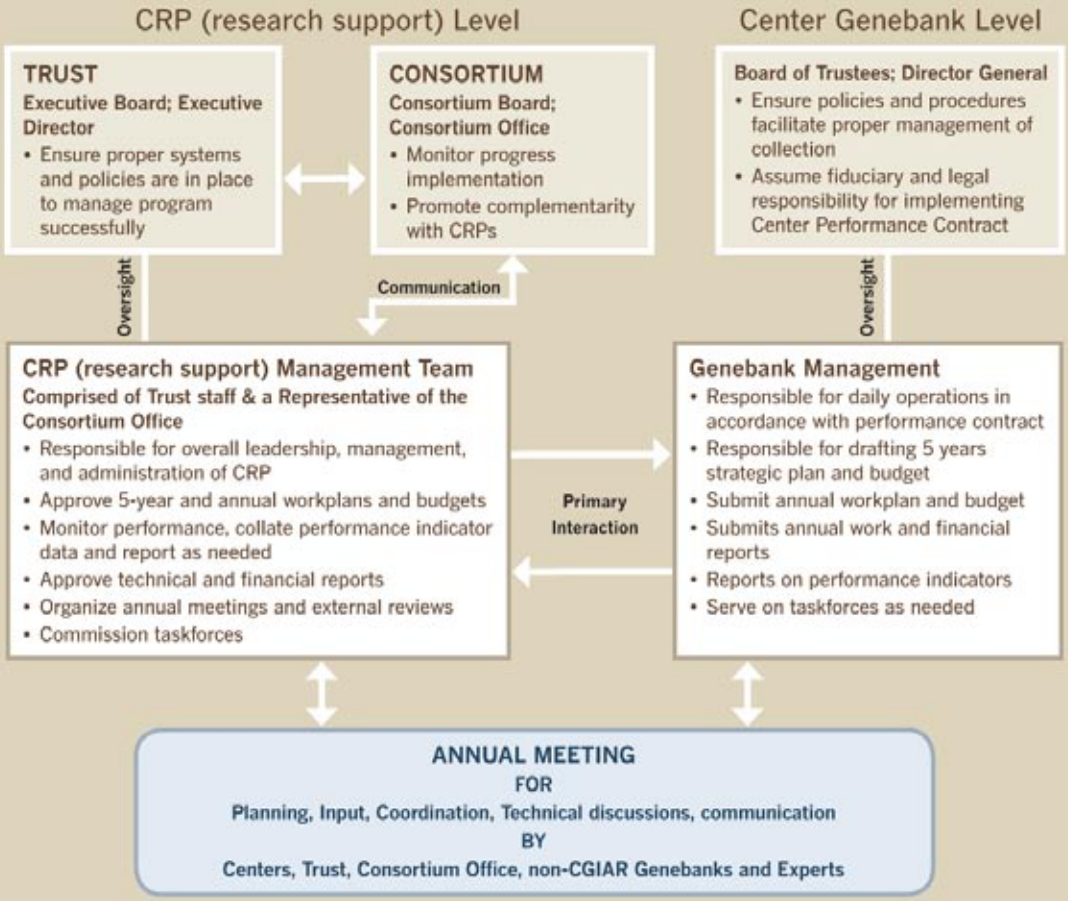
The overall management and governance of this CRP (research support) to manage and sustain the CGIAR collections will involve the Consortium Board, the Consortium Office, the Trust Board, the Executive Director of the Trust, and CRP (research support) Management Team. The Trust Board and Executive Director will exercise oversight of the management to ensure full execution of the performance contract. They will take a leadership role in the CRP (research support) to sustain and manage the CGIAR collections for the long-term. They will account to the Consortium Board, providing financial analysis, risk assessment and oversight of the Trust Performance Contract. They will support the CRP (research support) Management Team and ensure that the proper systems and policies are in place in order to successfully manage and implement the performance contract with the Consortium.

This partnership of the Trust with the Consortium, through the Consortium Office, is a critical part of the CRP (research support). The Consortium Office is responsible

for following up the Consortium Board's decisions to ensure implementation and for facilitating synergies in the CRP portfolio, including best practices and their implementation. This role will be critical in particular in ensuring complementarity in interactions between the other CRPs and the CRP (research support). The Consortium Office also has a specific role in the set-up and management of shared research support services for the Consortium. They have an overall coordination role for both the issues that cut across genebanks and emerging genetic resource issues. Thus, the Consortium Office will be a member of the CRP (research support) Management Team to promote coordination and ensure that there is opportunity for feedback to Taskforce reports, workplans, etc. The Consortium Office will not, however, participate in the day-to-day program management. The Consortium Office will also participate in the Annual meeting when workplans, new initiatives and strategic cross-cutting issues are addressed.

At the Trust, the CRP (research support) Management Team will be lead by the Assistant Executive Director. It will include a technical expert, an administrative assistant, a resource mobilization/communications expert, and a finance manager and will be supported by other staff members. Trust staff will be allocated fully or partially to the CRP (research support) as needed (see Annex 4). They will be responsible for the overall management and administration of the CRP (research support) and the long-term grants at the Trust that complement this program. They will liaise with the Center genebank managers and management as needed. They will be responsible for approving annual workplans and budgets, monitoring and collating performance indicators, collating approved technical and financial reports to submit to the Consortium, communicating on the CRP (research support), organizing annual meetings and external reviews, commissioning taskforces, and representing the CRP (research support) as requested by the Executive Director of the Trust and/or the management of the Centers.

FIGURE 1. GOVERNANCE AND MANAGEMENT



Each of the Centers will continue to manage their collections with oversight from the Center management and governance by the Center Board. This will be guided by and comply with a performance contract. The Board and management of the Centers will continue to ensure that their own policies, vision, mission, and values facilitate the management of the collection. They will have to assume the fiduciary and legal responsibilities, as well as accountability, for implementing the performance contracts with the Trust.

This proposal anticipates a 5-year budget commitment with a stable budget overall as identified herein. Upon receipt of satisfactory reports and budgets, and on the basis of agreement over any needed modification to operations and budget, the Trust will certify financial disbursements to the individual Centers by Bioversity International, acting in the same capacity as in 2011.

The Trust will regularly provide information to the Consortium Office that will enable it to develop a budget for capital replacement. It will also report to the Consortium Office any policy-related developments or issues that it identifies or anticipates requiring attention at the Consortium level. The Trust will make use of annual meetings foreseen in this proposal to detect and facilitate initial Center exploration of such issues.

Initially, Centers will be asked to submit an indicative 5-year master plan and budget to the CRP (research support) Management Team at the Trust. This will provide an overall strategic vision for the work of the genebank during this period as well as an indicative work plan for the period. This planning process could provide an opportunity to explore assumptions and strategies, question approaches, and identify potential areas for change, improvement, and synergies with other genebanks. Once approved, in principle, this will enable the Centers to proceed with a basic understanding of the funding that will be available for a given set of activities for five years. Annually, in November, Centers will submit a final workplan and budget for the coming year to the CRP (research support) Management Team at the Trust. And early in the next year, Centers will provide an annual narrative, data on agreed performance and management indicators, and financial reports for the previous calendar year. This annual reporting will facilitate due diligence in monitoring activities and overseeing use of funds. The CRP (research support) Management Team will discuss this combination of proposed workplan and budget and the report from the previous year with each Center in order to come to an agreement over the new workplan and budget. We would not anticipate that radical changes would be made on this occasion, assuming that workplans were generally in line with the 5-year plan, but this annual review could provide an occasion for modest adjustments to plans and budgets to align with the output of the Annual Meetings, other Centers' plans and evolving standards.

At the Trust, the CRP (research support) Management Team will organize an annual meeting of genebank managers, senior management from the Centers, other CRP leaders, Consortium Office staff, and other genebank managers or external experts as relevant. The meetings will provide an opportunity:

- For the CRP (research support) Management Team to confer with Centers individually and collectively over their annual workplans and budgets.
- To foster communication and cooperation within the CRP (research support), with other CRPs, and other genebanks or external experts on technical and policy matters.
- To strengthen concrete collaboration outside CGIAR walls.
- To explore and resolve specific issues identified by the Trust and Centers where significant effectiveness or efficiency gains might be made – issues of strategy and scientific practice.
- To facilitate modifications to strategies and operations, and catalyze new initiatives involving more than individual Centers.

During the 5-year period, specific issues will be addressed by Taskforces that will include relevant Center representatives and external experts. These groups will be responsible for exploring issues and developing a set of recommended actions that will be presented to the annual meetings for discussion and possible incorporation into workplans and budgets. These Taskforce advisory groups will be constituted and commissioned by the CRP (research support) Management Team with input from the Centers.

During this 5-year period, the CRP (research support) Management Team will constitute and commission one external review per Center. The review team composition and terms of reference will be constituted with input from the Center. A CRP (research support) Management Team member from the Trust will coordinate the review teams to promote a uniform approach and ensure communications. These reviews will provide the occasion for identifying and contending with major issues of science, strategy and management at the Center level. Discussion of any substantial changes to operations would typically take place through this review process.

To reiterate, the main management elements for the CRP (research support) include:

1. Five-year strategic plan and budget for each Center
2. Yearly work plans and budgets approved by the Trust
3. Annual program and financial reports
4. Annual certification of funds to flow to Centers based on approved work plans, budgets, and program and financial reports from the previous year
5. Annual meeting of all Centers to confer on technical and policy matters and address larger crosscutting strategic and management issues with the input of Taskforce advisory groups and other genebanks
6. Five yearly comprehensive review of each Center genebank.

The planning, evaluation and budgeting involved with each of the elements will be accomplished in reference to specific objectives and activities, and against both quantitative and qualitative performance indicators. In addition, genebank operations and practices will be documented to provide a detailed "reference point" of what was actually costed as part of the Costing Study and to enable the monitoring of changes and progress.

11 Innovation: The Trust as Partner

Established in 2004 under international law, the Trust is an offspring of the CGIAR. It was founded in large part to give stability and permanence to funding of the CGIAR collections, in essence to guarantee that the CGIAR, as trustee of the world's most important collections of crop diversity, can discharge this responsibility faithfully.

The Global Crop Diversity Trust has a unique relationship with the International Treaty on Plant Genetic Resources for Food and Agriculture. It has a formal Relationship Agreement with the Treaty's Governing Body, signed at the first meeting of the latter. This Agreement recognizes the Trust as "an essential element of the Funding Strategy" of the Treaty in regards to the conservation and availability of *ex situ* collections of plant genetic resources. The Trust is the only organization so recognized in this area.

GENEBANK IMPACT STORY #8

"As a result of crop improvement research within and beyond the CGIAR, 65% of the total area planted to the world's 10 most important food crops is sown to improved varieties."

The CGIAR at 40 and Beyond
Impacts that Matter for the Poor and the Planet

The Trust is structured as an endowment fund. Its business plan calls for a set percentage of the funds (calculated as 4% of the average value of the fund over 12 quarters) to be withdrawn annually. Investments are made according to a model that is intended to cover this amount plus inflation, with the smallest amount of risk possible to achieve this investment return goal.

In the past, CGIAR genebanks have drawn heavily on unrestricted core funding, supplemented by smaller grants from different donors. Funds were provided by dozens of donors, not all of which were always reliable. This situation was not ideal; the founding of the Trust was tacit acknowledgement of this by all concerned. In times of crisis, Center managements might cut genebank budgets. No Center genebank has escaped this unfortunate situation over its entire history. At times, the cuts have forced quick and large (>25%) reductions in genebank staffing. Even in the best of times, funding levels were not always ideal. The establishment of an endowment fund through the Global Crop Diversity Trust was intended to ensure that the funding required to conserve this biodiversity and meet international obligations was provided without interruption, that it was and would continue to be stable, reliable and sustainable.

As the only dedicated global organization working exclusively on *ex situ* conservation of plant genetic resources, the Trust has a unique perspective: it genuinely looks across crops and regions. Its work with national and international partners within and outside the CGIAR also puts it in a position to compare strengths, standards and costs across crops and institutes.

Structured as an endowment fund, it has a strong interest in ensuring economic efficiencies. Inefficiencies raise costs and require larger endowments.

This combination of institutional self-interests – effectiveness and efficiency – make the Trust a natural candidate for partnering with and providing leadership in developing a global system and in promoting robust administration of funds.

From a standing start in 2004, the Trust's endowment, programs and influence have grown tremendously. The Trust has raised a total of $221 million, of which $122 million was earmarked for the endowment. The value of the endowment as of 31 December 2011 is $120 million. In addition, the Trust has provided $9.3 million in grants from endowment income. Currently, the Trust provides $2.2 million annually to CGIAR genebanks for their operations under 5-year contracts that forward-commit $11.5 million. The Trust has also provided additional project-funding to CGIAR Centers in recent years, $4.6 million since April 2007, for example.

The Trust's global presence involves concrete project working relations (contracts) with 100 institutes in 89 countries. The purpose of this work has been to secure the genepool of priority crops and put in place the capacity to conserve it and make it available in a globally rational and cost efficient manner. In practice this has meant:

- Developing crop strategies that identified the genetically most important (unique) crop collections and partnering with developing country holders to "rescue" some 90,000 unique and vulnerable accessions in these collections.
- Supporting work to develop more effective and less costly methods for conservation and distribution of particularly difficult and expensive-to-conserve collections (banana, coconut, root and tuber crops) in order to lower long-term costs.
- Catalyzing and funding development of two information systems – GRIN-Global, a genebank management software tool, and Genesys, a global information portal for plant breeders and researchers.

The Trust is making long-term grants towards the conservation of 18 Center-held crop collections. In addition, it also has a long-term grant agreement with the Secretariat of the Pacific Community in Fiji.

These grants are structured as rolling 5-year grants. At the end of the first year of the five years, when four years remain, the term of the grant automatically resets to five years unless one Party gives notice that it wishes to terminate the arrangement. This provision provides the genebanks with surety that funding will be reliable. It allows and encourages them to engage in long-term planning and to make rational investments, impossible if they only know what their budget is for a single year. The rationale for proposing a 5-year Plan to the Fund Council is linked with the existing structure and rationale of the Trust's grants to Centers.

Working together, the Trust and the CGIAR developed an agreed set of Performance Indicators. These are used in monitoring progress and identifying problem areas. It is proposed that these form the basis for annual monitoring under the plan presented here (Table 5).

In June, 2011, the Trust sponsored a meeting of its long-term grantees and other major *ex situ* partners. This meeting facilitated a review of activities, and promoted tangible cooperation across institutes (CGIAR and non-CGIAR), for example in an initiative to collect, conserve and pre-breed crop wild relatives. It is proposed that the Trust convene similar meetings in the future for similar purposes.

Finally, the Trust plays a major role in the operations and funding of the Svalbard Global Seed Vault. With Trust support and financing, CGIAR Centers have safety duplicated 506,937 samples in the Seed Vault to date.

To summarize, the Trust has focused on 7 key elements to construct a sustainable global system for long-term conservation and availability. It has:

- Identified and rescued vulnerable unique samples held in genebanks
- Initiated a program to collect and conserve the remaining diversity of major crops (in their crop wild relatives)
- Committed to and provided long-term funding of key collections (primarily CGIAR held)
- Promoted research to improve conservation techniques and lower costs
- Helped develop information systems to better manage genebanks and to promote use by breeders
- Catalyzed development of the Svalbard Global Seed Vault, as an insurance policy for key international and national collections
- And finally, the Trust has effectively engaged in public awareness, promoting the importance of conserving agrobiodiversity as critical to addressing problems of poverty, food security and climate change adaptation.

The total of these activities represents a focused strategy for constructing a global system, and together with long-term funding from the Trust's endowment, for ensuring the rational conservation and the practical availability of crop diversity in perpetuity. No such comprehensive, strategic approach existed prior to the founding of the Trust.

Due to its global vision and goals, and significantly due to its being structured as an endowment fund, the Trust shares with the Consortium and the Fund Council a strong commitment to efficiency and effectiveness. It has an institutional interest in "making the system work" at the individual institutional level, and collectively. It is hard-wired to engage in long-term planning, to look for synergies and for cost-effective investments, and to consider the concrete ways in which management of *ex situ* collections can be made more professional and truly sustainable.

12 Risks

Major risks to the conservation and availability of plant genetic resources fall primarily into two broad categories. One relates to funding, the other to direct physical threats that might arise from "natural" or political factors.

1. Inadequacy and instability of funding lie behind the most serious and pervasive threats to genebank collections. Recognizing this – and acknowledging that this risk applied to its own collections – the CGIAR moved to establish the Trust. This provided the mechanism – a non-depleting endowment – for stable on-going funding. The responsibility for building the endowment to the required level logically lies today with the CGIAR and its supporters, and the Trust. This proposal addresses the most important of risks, the financial risk, by proposing a partnership, as well as initiatives and mechanisms, to complete the endowment.
2. Natural disasters, civil unrest, and on occasion political factors have threatened collections and their management in accordance with international norms and standards. This proposal sets as a target the 100% safety duplication of CGIAR long-term seed collections in the Svalbard Global Seed Vault.

Genebank managers face and mitigate a number of more routine and lower level risks, and these are identified indirectly in Table 3 that details "issues and exceptions" to routine genebank operations, and in Table 5 that identifies specific targets that, naturally, assist in identifying impediments and risks in achieving those targets. Five-year strategic plans, annual work plans, one-on-one and collective meetings of genebank managers, etc., as envisaged in this proposal, provide mechanisms for articulating the various technical risks and mitigating them.

13 The Transition to Sustainable Funding

In its April meeting the Fund Council reiterated the same logic that had driven the CGIAR, together with FAO, to establish the Global Crop Diversity Trust. Ad hoc funding is not a responsible way to discharge the awesome responsibility which the genebank collections impose on the CGIAR, and it is critical, not only for the CGIAR but for mankind, to have a sufficient endowment to provide permanent financial security.

It follows, therefore, that the five-year work program of work described in this proposal must include the transition to sustainable funding. Unlike other elements of this proposal, however, success in this regard requires an alliance not only of the Trust, the Consortium and the Centers, but of the Fund Council and the wider group of CGIAR donors.

The cost-benefit ratio of conserving crop diversity is, quite simply, enormous in monetary terms and incalculable in human terms. The five-year timeframe covered by this proposal provides a realistic period within which to raise a sum sufficient to the task. Completion of the endowment is an appropriate and achievable goal and would be nothing short of inspirational for the CGIAR and the international community. Without a successful transition to sustainable funding, the partnership between the CGIAR and the Trust is incomplete and worse yet, undermined. Conversely, a completed endowment, and with it permanent financial safeguards for the Centers' genebanks, would be a fitting monument to the CGIAR's "new way of doing business".

CONCLUSION AND DECISION

"…ad hoc funding is not a responsible way to fund genebanks. Hence, it is critical for the CGIAR to find a way to have long term surety and a sufficient endowment for this important material for mankind."

CGIAR Fund Council-4. April 2011

TARGET

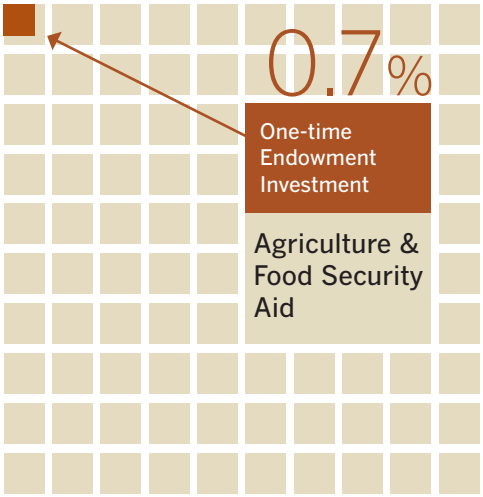
Based on the Costing Study the Trust now sees $525 million as its endowment target, of which approximately $120 million is in hand. An endowment of $525 million[1] would suffice to meet all core recurring genebank expenses associated with conservation, multiplication and distribution, in perpetuity beginning in 2017[2]. However, were a mechanism

[1] In 2012 USD

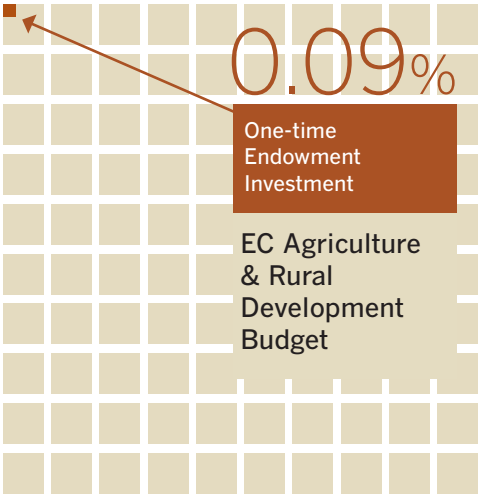
[2] The budget proposed for 2012-2016 provides for an in-kind contribution from the Trust covering staff, board, endowment management and other expenses. As of 2017, such expenses would be covered by the endowment itself.

agreed whereby Center breeding programs compensated genebanks for the basic costs associated with multiplication and supply of germplasm for those Center research programs, the endowment required would be reduced to $420 million. The question then is whether the CGIAR and its donors wish to finance the entire genebank operations from the endowment mechanism, or whether they wish to finance conservation costs plus costs associated with distribution of materials to non-CGIAR recipients through the endowment, and supply the remaining costs associated with supporting Center research programs on an annual basis. This could either be through the Fund, or through Center fundraising from bilateral sources, or a combination.

What portion of Foreign Aid Budgets for Agriculture & Food Security is needed over the 5-year period of the CRP (research support) to complete the Trust Endowment?



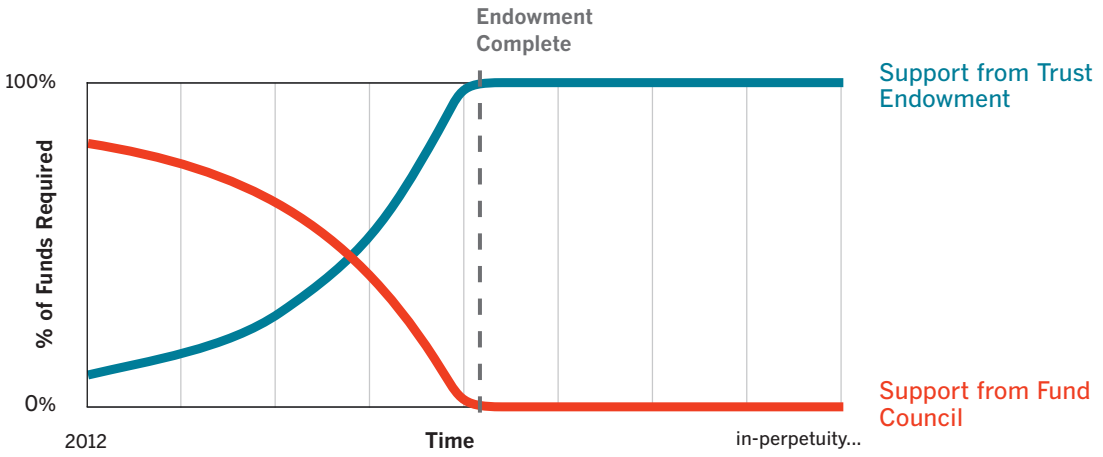
What portion of the EC Agriculture and Rural Development Budget is needed over the 5-year period of the CRP (research support) to complete the Trust Endowment?



PROGRESS TO DATE

In a difficult funding and investment environment, the Trust has managed to raise some $220 million, of which approximately $120 million is for the endowment. It has succeeded in managing these funds so as to preserve capital and provide a steady and increasing stream of grants to Centers for genebank operations. Increases in the endowment allow for commensurate decreases in annual grants by donors for genebank operations. Guaranteed funding backed by the endowment replaces the vagaries of annual funding drawn from multiple sources. And, professional oversight and system planning is added. This is the outcome that the Consortium, the Centers, and the international community desire.

INDICATIVE FUNDING REQUIREMENTS FOR GENEBANKS, AS TRUST ENDOWMENT GROWS



To achieve this outcome:

1. Donors will be asked to address the completion of the endowment and the transition to sustainable funding for CGIAR genebank collections as a prominent agenda item at the fundraising meeting the CGIAR anticipates convening later in 2012.
2. The Trust together with the Consortium and Fund Council will, as needed, organize a separate follow-up meeting with donors specifically devoted to making the transition to sustainable funding that the Fund Council previously indicated that it desired.
3. In the interim, and as part of the transition, the Fund Council may agree a separate mechanism for financing that part of genebank expenses that are associated with direct servicing of CRPs. That mechanism might include provision of annual supplementary funding for this cost beginning in 2015. Regardless, research and breeding program budgets should include the genebank contribution as a line item, whether or not compensatory funding is decided, in order to acknowledge the unfunded in-kind contribution made by genebanks. (The Costing Study provides the basis for specifying this contribution).

It is in the interest of the Consortium, the Centers, the Trust and donors to ensure the long-term sustainable funding of Center-held collections. The 5-year period of this program constitutes the transition period to this outcome.

The Budget presented herein is thus a "worst case scenario," in the sense that it does not specify a decreasing annual contribution from Window 1 commensurate with an increase in Trust funding, as a result of the growth of the Trust's endowment. However, it should be understood that building the Trust's endowment will directly and permanently reduce the funding requirement from Window 1. In this transitional period, the Fund Council will be updated annually on the budget situation and any change, i.e. reduction, in Window 1 requirements.

The transition to secure and sustainable funding is an integral part and major output of this program. The subject of how to build the endowment and bring sustainable funding to the collections, including the elements presented here and others that the Fund Council may consider worthwhile, must therefore be concretely addressed by the broad alliance of the Trust, Consortium, Centers, Fund Council and other CGIAR donors.[3]

3 This is likely to require additional inter-sessional work and additional consideration at future Fund Council meetings.

14 Budget

The total budget for the five year period is estimated at $109 million. The attached budget shows also the anticipated funding sources, but it is worth noting that due to anticipated growth of the Trust endowment we would envisage an annual re-calibration of the need for window 1 funding - hopefully this will decrease from the currently-estimated level.

"Sustainable food production may not begin in this cold Arctic environment, but it does begin by conserving crop diversity."

Ban Ki-Moon, UN Secretary-General

Due to the impossibility of forward planning for 2012, we propose that the 2012 budget for those activities that were costed in the Costing Study be based upon the Costing Study figures previously approved for 2011 funding by the Fund Council, inflation adjusted and with minor modifications. Activities identified as critical but not costed in the Costing Study are identified in the narrative (Parts 3.3 and 5).

Note in particular that the budget has been amended to include an allocation for ICRAF, whose costs were identified by a follow-up study. It includes coverage of Genesys, as a core element, essential to long-term management, distribution and use of the collections, and activities identified as non-recurring strategic element.

Subsequent years' budgets for the above activities will reflect more directly the implementation of the long-term plans and any modifications to activities and strategies that are made.

2011 AND 2012-2016 BUDGETS IN $M

I. CORE REQUIREMENT 1/							
CENTER	**2011 ACTUAL**	**2012**	**2013**	**2014**	**2015**	**2016**	**TOTAL**
AfricaRice	0.34	0.35	0.36	0.37	0.38	0.39	1.9
Bioversity	0.97	1.00	1.03	1.05	1.07	1.10	5.2
CIAT	2.40	2.48	2.53	2.59	2.64	2.70	12.9
CIMMYT	1.17	1.21	1.23	1.26	1.29	1.32	6.3
CIP	3.23	3.34	3.42	3.49	3.57	3.65	17.5
ICARDA 2/	1.30	1.49	1.53	1.56	1.60	1.63	7.8
ICRISAT	2.46	2.55	2.60	2.66	2.72	2.78	13.3
IITA	1.13	1.17	1.20	1.22	1.25	1.28	6.1
ILRI	0.84	0.87	0.89	0.91	0.93	0.95	4.5
IRRI	1.39	1.44	1.47	1.51	1.54	1.57	7.5
SUB-TOTAL	**15.2**	**15.9**	**16.3**	**16.6**	**17.0**	**17.3**	**83.1**
II. ADDITIONAL REQUIREMENT		2012	2013	2014	2015	2016	Total
World Agroforestry costing and rationalization 3/		1.00	1.02	1.04	1.07	1.09	5.22
Cryobanking (Bioversity, CIP, IITA, CIAT)		0.60	0.61	0.63	0.64	0.65	3.13
Additional acquistions and collecting (all centers)		0.20	0.20	0.21	0.21	0.22	1.04
Optimizing collections (where this is not in a CRP)		0.80	0.82	0.84	0.85	0.87	4.18
Global outreach, capacity building, etc. (all centers)		0.80	0.82	0.84	0.85	0.87	4.18
GENESYS and GRIN-Global 4/		0.67	0.68	0.70	0.72	0.73	3.50
	SUB-TOTAL	**4.1**	**4.2**	**4.3**	**4.3**	**4.4**	21.3
III. MANAGEMENT AND PROGRAM COSTS		2012	2013	2014	2015	2016	Total
Management: GCDT personnel, travel, communications, etc.		0.49	0.50	0.51	0.53	0.54	2.6
Program: Thematic advisory committee, fundraising, ext rev, coordination		0.32	0.33	0.34	0.34	0.35	1.7
	SUB-TOTAL	**0.8**	**0.8**	**0.9**	**0.9**	**0.9**	**4.3**
III. TOTAL REQUIREMENT		**20.8**	**21.2**	**21.7**	**22.2**	**22.7**	**108.6**
FINANCING SOURCES		2012	2013	2014	2015	2016	Total
Global Crop Diversity Trust 5/		2.6	2.9	3.1	3.5	3.8	15.9
Window 1		18.2	18.4	18.6	18.7	18.9	92.7
	TOTAL	**20.8**	**21.2**	**21.7**	**22.2**	**22.7**	**108.6**

1/ The 2012 budget is increased by 3.4% (US CPI for 2011). Years 2013-2016 are inflated by 2.2% (avg of 2007-2011 US CPI).
2/ The position of curator for ICARDA was discussed in the costing study as a requirement but was not budgeted for 2011. It is included for 2012 and beyond.
3/ The World Agroforestry genebank was not included in the 2011 program. From 2012 it is included as an "up to" amount as additional work is needed to define exact costs.
4/ The figure includes approximately $2 million from the Trust's own funding.
5/ The growth assumption is 3.4% for 2012 and 10% annually thereafter.

ANNEX 1 Fund Disbursement Strategy

EXECUTIVE SUMMARY

The Trust has limited funds at its disposal and is constrained by its Constitution to use those funds in the most cost-effective way to ensure the attainment of its objective of ensuring the long-term conservation and availability of plant genetic resources for food and agriculture (PGRFA) - with a view to achieving global food security and sustainable agriculture. In particular the Trust is required to focus on safeguarding collections of unique and valuable PGRFA held *ex situ*, and to promote an efficient goal-oriented, economically efficient and sustainable global system of *ex situ* conservation. The Trust's Fund Disbursement Strategy is based on the principles and strategies in the Global Plan of Action and the principles within the International Treaty. It is developed around a number of assumptions, including the assumption that an efficient and effective conservation system must build on existing institutions and facilities. It is also based on the realization that the objectives of the Trust cannot be achieved by distributing available resources among all of the world's existing genebanks and that the Trust must focus its support on collections of unique PGRFA of global significance. The Trust's Fund Disbursement Strategy focuses on three major areas: Securing PGRFA of global significance; Promoting Participation and Increasing Benefits; and Increasing Efficiency and Effectiveness within and between collections. In working towards an efficient and effective global conservation system, the Trust has adopted four basic principles for eligibility for funding support, as well as a set of more specific eligibility criteria.

INTRODUCTION

Article 6.3(f) of the Constitution of the Trust provides that the Executive Board shall "adopt the fund disbursement strategy for the Trust, including the proposed balance between support for collections held by national institutions and support for collections held by international institutions, and the balance between regions. Before adopting such strategy, the Executive Board shall consult with the Governing Body and Donors' Council". The Executive Board is pleased to present the following draft Fund Disbursement Strategy to the Donors' Council for its consideration as part of the consultation process envisaged above.

MANDATE OF THE TRUST

The main lines of the Trust's Fund Disbursement Strategy are derived from, and to some extent dictated by, the Objectives of the Trust, as set out in Article 2 of the Constitution.

The **general objective of the Trust** is "*to ensure the long-term conservation and availability of plant genetic resources for food and agriculture - with a view to achieving global food security and sustainable agriculture*.[1]

The way in which the Trust is required to fulfill this general objective, is set out in some detail in the Constitution. Without prejudice to the generality of its objective as stated in Article 2.1, the Trust is required to –

(a) *endeavour to safeguard collections of unique and valuable plant genetic resources for food and agriculture held ex situ , with priority being given to those that are plant genetic resources included in Annex I to the International Treaty or referred to in Article 15.1(b) of the International Treaty;*
(b) *promote an efficient goal-oriented, economically efficient and sustainable global system of ex situ conservation in accordance with the International Treaty and the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (hereinafter referred to as "the Global Plan of Action");*
(c) *promote the regeneration, characterization, documentation and evaluation of plant genetic resources for food and agriculture and the exchange of related information;*
(d) *promote the availability of plant genetic resources for food and agriculture;*
(e) *promote national and regional capacity building, including the training of key personnel, with respect to the above.*[2]

While the general objective of the Trust is broadly stated, the statement of specific objectives make it clear that the work of the Trust should, at least initially, be focused primarily on *ex situ* conservation and related activities. The Governing Body of the International Treaty itself has recognized the Trust as an essential element of the Funding Strategy of the International Treaty in relation to the *ex situ* conservation and availability of plant genetic resources for food and agriculture.

AN EFFICIENT GOAL-ORIENTED, ECONOMICALLY EFFICIENT AND SUSTAINABLE GLOBAL SYSTEM OF *EX SITU* CONSERVATION

In recognition of the reality that resources are always less available than the calls upon them, the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture[3] calls on countries to "develop an efficient goal-oriented, economically efficient and sustainable system of *ex situ* conservation" and to "develop and strengthen cooperation among national programmes and international institutions to sustain *ex situ* collections". This call is reiterated in the International Treaty, which requires Contracting Parties to "cooperate to promote the development of an efficient and sustainable system of *ex situ* conservation". To a large extent, the task of developing an efficient and sustainable system of *ex situ* conservation is made easier by the principle of facilitated access to PGRFA under the Multilateral System established by the International Treaty. This makes it possible for countries to rely on PGRFA in the Multilateral System conserved outside their own jurisdictions, and obviates the need for each country to maintain its own independent collections of all the PGRFA it may ever need for its agricultural development.

While the International Treaty does not provide definitive guidance as to what should constitute an efficient and sustainable system of *ex situ* conservation, a sound framework has

[1] Constitution, Article 2.1
[2] Constitution, Article 2.2
[3] The Global Plan of Action was adopted by 150 countries by the FAO International Technical Conference on Plant Genetic Resources held in Leipzig in 1996

been provided by the Policies and Strategies for sustaining existing *ex situ* collections[4] and regenerating threatened *ex situ* accessions[5] set out in Activities 5 and 6 of the Global Plan of Action. The International Treaty itself recognizes the continuing importance of the Global Plan of Action and, as noted above, the Constitution of the Trust requires the Trust to promote "an efficient goal-oriented, economically efficient and sustainable global system of *ex situ* conservation" in accordance with both the International Treaty and the Global Plan of Action.

Additional input as to what an efficient and sustainable system of *ex situ* conservation should look like has been provided through the crop and regional strategies funded by the Trust to assess the current state of *ex situ* conservation and the needs for future action, as well as through the process for the updating of the Global Plan of Action and technical papers from the scientific community generally.

This Funding Strategy therefore seeks to contribute to the common good by establishing the most economically efficient and sustainable funding for that part of the global system which will be managed by the Trust, The Trust will take a goal-oriented and disciplined approach in its disbursements, basing itself on the concepts and guidance set out in the Global Plan of Action and the International Treaty, focusing financing on activities that provide a triple advantage: they provide global benefits, aim to conserve unique biodiversity, and are cost-effective, efficient and sustainable. Deliberate and continuing choices will be made among alternative possibilities in order to focus on those activities that meet these criteria.

The Trust cannot fulfill its Constitutional Objective by distributing its limited resources among all of the world's existing 1,500 genebanks or trying to maintain all genebank infrastructure.

---

[4] The relevant provisions read as follows:
*"82. **Policy/strategy:** The international community has interests in and responsibilities for the ex situ conservation of plant genetic resources for food and agriculture. It is this understanding which provides the basis for an effective, integrated and rational global plan to secure existing collections. Countries have national sovereignty over, and responsibility for, their own plant genetic resources for food and agriculture.*
83. Full use should be made of appropriate existing facilities, including national, regional and international centers. Conserved materials should be, as appropriate, replicated and stored in long-term facilities meeting international standards, in accordance with applicable international agreements. Unintended and unnecessary duplications between collections within the networks should be reduced to promote cost efficiency and effectiveness in global conservation efforts. Countries could be assisted in identifying which genetic resources are already stored and duplicated in long-term facilities.
84. FAO in cooperation with countries and with relevant institutions should facilitate the formalizing of agreements to safeguard diversity in ex situ collections in conformity with applicable international agreements This would allow those countries so desiring to place collections voluntarily in secure facilities outside their boundaries."

[5] The relevant provisions read as follows:
*"98. **Policy/strategy**: Priority should be given to:*
- *regeneration needs of samples currently in long-term storage or intended for placement in long-term conditions and experiencing a loss of viability as opposed to those in need of multiplication for other reasons.*

(Proper management will assure that accessions in long-term conditions will be regenerated mainly due to loss of viability and those in active collections multiplied due to loss of numbers.)
- *samples which meet the criteria of being globally unique, threatened, and having the potential of maintaining the diversity of the original sample.*

99. Input from crop and regional networks should be sought in the refining of priorities and identification of appropriate germplasm for regeneration.
100. Identification of specific samples should be made in cooperation with national programme breeders and curators, who often have intimate and detailed knowledge of collections and of the possible availability of similar materials from in situ locations.
101. As appropriate and feasible, regeneration efforts should strive to maintain the allelic and genotypic diversity and adapted complexes of the original sample.
102. Efforts should be encouraged to reduce unneeded redundancies within and between collections as a means of improving efficiency and minimizing ongoing conservation costs. Regeneration should not be viewed as a means of maintaining collections in substandard conditions on a long-term basis. In this regard, it is noted that minimizing the frequency of regeneration is an important goal and consequence of other activities under the Global Plan of Action.
103. Governments, the private sector, institutions, including in particular the CGIAR, and NGOs should:
- *cooperate to make efficient use of existing capacity and to ensure that regeneration can take place, if scientifically, technically and administratively feasible, at sites closely approximating the origin of the original sample; and,*
- *promote and facilitate access to plant genetic resources for food and agriculture stored ex situ to minimise the need for storing identical samples in several locations, and the consequent need to regenerate each of them.*

104. Characterization activities should be undertaken in conjunction with regeneration, as feasible, without compromising the effectiveness or scientific goals of the regeneration exercise."

There has a gratifying and generous financial response to the creation of the Trust, in good part because of the discipline and focus assured to donors to date. Over the long term, however, financial resources will be far eclipsed by needs as the programmes grow. The initial target for the endowment fund was set at US$260 million, generating an estimated average income of approximately US$11.7 million. At the present time, the amount of pledged contributions to the endowment fund is less than two-fifths of the initial target and the amount of paid-up contributions is less than one-third of the initial target, generating an estimated average annual income of less than US$4 million[6].

ASSUMPTIONS UNDERLYING THE TRUST'S FUND DISBURSEMENT STRATEGY

The Trust's Fund Disbursement Strategy is based on the following assumptions:

First, it has been assumed that an efficient and effective conservation system must, at a minimum, be capable of carrying out a range of functions including acquisition, storage and maintenance, safety duplication, regeneration, multiplication, characterization, evaluation, documentation, distribution and promotion of the use of genetic material.

Second, that existing institutions and facilities constitute the starting point, and that the Trust should take advantage of this fact and build upon it through helping to develop and improve existing capacity in a progressive fashion. Efficiency considerations suggest that existing capacity should not duplicated or substituted where it already is accomplishing its task.

Third, that while any action must be firmly based on sound scientific and technical principles, to be effective, due account must also be taken of whether the political and social circumstances in which the collection holder operates are supportive or whether they may actually operate to prevent the collection holder from fulfilling its obligations.

Fourth, it has been assumed that increasing overall efficiency and effectiveness can be achieved through a number of specific system wide actions such as developing common databases, reducing unnecessary duplication, achieving a better division of labour, harmonising quality assurance standards and performance reporting, and strengthening collaboration.

Finally, it has been assumed that a robust global conservation system will require and benefit from concrete participation by all relevant institutions, not just those directly involved in providing long-term storage services. Conservation is not synonymous with storage. Consequently, Trust support will extend beyond the narrow storage function. It will promote conservation in a manner that promotes access and encourages use.

THE TRUST'S FUND DISBURSEMENT STRATEGY[7]

There are three major areas that the Trust will be involved in and support (Figure 1):

1. Securing PGRFA of global significance

Based on the assumptions stated above, and as a matter of priority and urgency, the Trust will allocate the largest share of its funds to securing distinct and valuable PGRFA by:

- supporting collections of unique PGRFA of global significance that meet international guidelines for conservation and distribution, including appropriate safety duplication (referred to by the Trust as priority or reference collections), but which are in need of

[6] This income is supplemented by non-endowment time-limited grant funds destined for specific project tasks, including regeneration, evaluation and upgrading, and information technology.

[7] The main elements of this Disbursement Strategy are already set out in the document "The Role of the Global Crop Diversity Trust in Helping Ensure the Long-term Conservation and Availability of PGRFA" which is dated May 2007 and is available on the Trust's website. A full copy of the document, including a detailed decision tree for identifying collections that may be funded and for determining the relevant funding category for those collections can be downloaded from the website at http://www.croptrust.org/documents/web/RoleOfTrust-May07.pdf

longer-term financial support to ensure that standards are adequately maintained;
- upgrading collections of unique PGRFA of global significance to meet international guidelines in cases where this is the most efficient and cost effective way to proceed; and,
- duplicating and securing important collections of unique PGRFA of global significance that are not already represented in a reference collection or in a collection in the process of being upgraded, from facilities that are unable to meet or be economically upgraded to accepted guidelines, to ones that can. This process may involve a number of related steps to help the institution providing the material to characterize and/or evaluate the collection (to confirm its uniqueness and relevance at the global level), to undertake multiplication and regeneration, and to update its databases to bring them in line with common data standards. This related assistance may well need to be continued even after the first round of assistance on regeneration and database updating.

2. Promoting Participation / Increasing Benefits

The Trust will allocate a certain amount of funding to support activities of international significance in collections that do not – or not yet - meet international guidelines for conservation and distribution. This might include, for example, support to national collections for activities such as:

- building documentation systems that are compatible with international protocols;
- characterization and evaluation for traits of international significance;
- collecting to fill gaps within the total genepool conserved by all participating collection holders;
- activities that promote access to and use of materials – and in particular the two-way links with farmers and professional plant breeders; and
- activities to strengthen the international operation of national programmes e.g. through strengthening their role in the transfer of materials into and out of the country.

Many of these activities will take place at the national and local level. The Trust anticipates providing resources, as feasible, to regional and crop networks and reference collections to support and coordinate such activities.

3. Increasing efficiency and effectiveness within and between collections

In order to reduce costs, and increase sustainability, the Trust will help reference collections of unique PGRFA of global significance collectively improve their efficiency and effectiveness through such action as promoting greater collaboration, strengthening common databases, reducing unnecessary duplication, etc. For the most part, activities in this area will be undertaken after those outlined above are well underway.

PRINCIPLES AND FUNDING CRITERIA

The Trust, in working towards the development and maintenance of an efficient and effective global conservation system, has adopted four basic principles that must be met in order for a collection to be eligible for support.

- The plant genetic resources are of global importance; priority will be given to plant genetic resources of crops included in Annex 1 or referred to in Article 15.1 (b) of the International Treaty.
- The plant genetic resources are accessible under the internationally agreed terms of access and benefit sharing provided for in the Multilateral System established by the International Treaty, and set out in the Standard Material Transfer Agreement.
- Each holder of plant genetic resources for food and agriculture commits itself to long-term conservation and availability of the collection for which support is requested.

- Each recipient of funds from the Trust shall undertake to work in partnership with the aim of developing an efficient and effective global conservation system that will also encompass financially independent collection holders not funded by the Trust.

In addition to, or to amplify these principles, the Trust has developed a set of more specific criteria to be met before a collection will be considered for long-term funding support. In cases where a collection meets the principles and is prioritized for Trust support, but is unable to meet the funding criteria, the Trust will consider providing support for the necessary upgrading and capacity building, where this will facilitate its meeting the criteria in the near future. The long-term funding criteria and the way in which they are applied will be kept under review and revised as needed. However, initially there will be five criteria.

- The recipient has effective links to users of plant genetic resources.
- The plant genetic resources are judged to be important or potentially important within the context of and according to the needs of a rational global system of *ex situ* conservation.
- The legal status of the collection and holder is such that their ability to meet the eligibility principles with respect to access and benefit-sharing, and their commitment to long-term conservation are assured.
- The recipient has the human resources and management systems needed to maintain the plant genetic resources and can demonstrate conformity with agreed scientific and technical standards of management.
- The facilities in which the collection is maintained are adequate to ensure long-term conservation.

While the above principles and funding criteria provide a threshold for eligibility, meeting those principles and criteria will not automatically mean that the collection will receive long-term funding support. In the end this will depend on whether or not such funding support will promote the development of an efficient and effective global conservation system.

BALANCE BETWEEN NATIONAL AND INTERNATIONAL INSTITUTIONS AND BETWEEN REGIONS

The Trust's Constitution provides that the Disbursement Strategy will include the proposed balance between support for collections held by national institutions and support for collections held by international institutions, as well as the balance between regions.

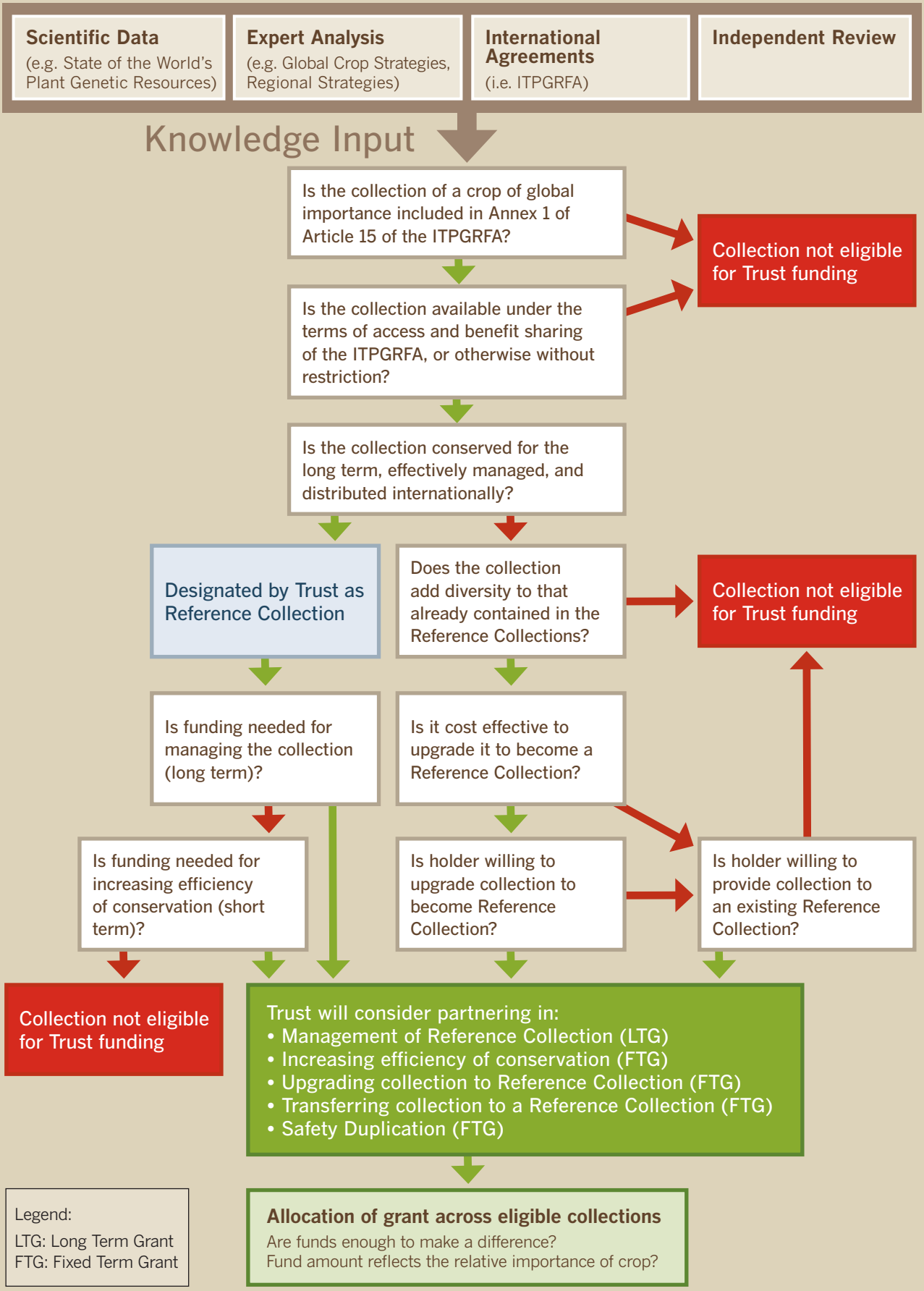
As noted above, the main thrust of the Trust's Disbursement Strategy is to provide financial support for collections of PGRFA operating within the context of an efficient goal oriented, economically efficient and sustainable system of *ex situ* conservation. Within this framework, the Trust will provide financial support to international and national collections of unique PGRFA of global significance as well as to regional collections that meet the principles and criteria set out above and that function as part of an efficient and sustainable global system.

CONCLUSIONS

The Trust has a broad and important mandate and only limited financial resources at its disposal. Only by taking a goal-oriented and disciplined approach in its disbursements can the Trust achieve its objective of ensuring the long-term conservation and availability of PGRFA. In particular, the Trust cannot provide the level of funding that would be required to maintain, let alone upgrade to adequate standards, all existing genebanks and their infrastructure throughout the world. What it can do is to focus its funding on activities that provide global benefits and that are cost-effective, efficient and sustainable within the context of building a rational global system of *ex situ* conservation. That is the

purpose of the Trust's Fund Disbursement Strategy. The Trust is fortunate that the Global Plan of Action has provided clear guidance on what should constitute an efficient and sustainable system of *ex situ* conservation. The Trust firmly believes that only by focusing its efforts through this Strategy can it hope to meet its objective of ensuring the long-term conservation and availability of plant genetic resources for food and agriculture with a view to achieving global food security and sustainable agriculture for the benefit of all.

FIGURE 1. DECISION PROCESS FOR ASSESSING COLLECTIONS AS ELIGIBLE FOR TRUST FUNDING



ANNEX 2

CGIAR / Trust Costing Study: Explanatory Note (excerpted)

Using financial data provided by the Centres, the cost of each of the above activities was obtained for each collection in each Centre using a recently developed crop genebank Decision Support Tool. For comparability, costs were determined on a per accession basis and were divided into recurrent costs (costs for activities that take place every year or that could be annualized) and "one-off" costs that occur only once (at least in theory) in the "life" of an accession, such as acquisition, characterization and introduction into *in vitro* or cryopreservation. Other one-off costs for the overall optimization of the collection were also considered, such as the need to eliminate backlogs in regeneration, or to bring all of a collection into long-term storage. Centres maintaining collections of the same crops were compared to determine any underlying factors leading to differential costs and to rationalize among Centres to the extent possible. However, a complete comparison of costs between similar collections at different Centres was not feasible in this study due to numerous complicating factors. For example, collections such as wheat maintained at two different Centres have different internal uses, outside clients, structures, composition and purposes, and they operate in very different institutional environments with respect to such things as wage and salary scales, costs for electricity and other services, and size of operation.

Overhead and capital costs were taken into account to the fullest extent possible however methods to fully recover costs have not yet been implemented at all genebanks. On those Centres that have, some discrepancies prevail in the details that are impractical to address in this study. An example is costing the full direct cost of computers when they are only partly used for management of the genebank's accessions. A detailed consideration of the cost of all current and future capital costs for the genebanks was also beyond the scope of this study, in view of the many and complex variables associated with technology, new unit costs, the establishment of a replacement fund, etc.

It became clear in the study that the most important factor affecting the individual accession cost, apart from the overhead of the Centre and one-off activities, was the periodicity of regeneration and associated activities such as germination testing and seed health testing. These activities have high labour costs associated with them. Any means of extending the period between regenerations such as regenerating larger seed quantities,

distributing smaller seed quantities and ensuring optimal storage conditions to preserve viability should reduce costs significantly.

Vegetatively-propagated crops such as Andean root and tuber crops, banana, cassava, potato, sweetpotato and yam, incur significantly higher costs per accession than seed crops, due in large part to the large amount of skilled labour required for in-vitro conservation. Alternative methods of long-term storage such as a greater use of cryopreservation or true seeds should reduce costs overall, but in most cases further work is required to develop robust protocols. In the case of true seed, only alleles would be conserved, not genotypes.

In spite of the limitations of the study mentioned in the report, the consultants believe the results represent an important step forward in understanding the real costs of maintaining and distributing the Centres' germplasm collections and associated information. However, it should be noted that what is provided is a snapshot of costs at this particular point in time. The situation is not static and will continue to evolve. For example, most of the collections are expected to continue to increase in size – by about 7.5% between now and 2015 - although it might be possible to reduce the size of some by eliminating duplicates. The study predicts that the total size of the collections will reach almost 756,500 accessions by 2015, requiring a total annual funding of US$15.93 to maintain. The collections are also expected to acquire proportionally more accessions of wild relatives, and these are generally more difficult and expensive to maintain than cultivated accessions. It might be possible to reduce the cost of clonal collections through a greater use of cryopreservation, true seed and other technologies but in many cases this will require further research and a considerable up-front expenditure before any cost savings can accrue. While the costs of molecular characterization are expected to fall, the need might well increase for more virus and other disease elimination through indexing and cleaning. For these and many other reasons, it will be important that the Consortium, the Trust and genebank managers continue to monitor costs over the coming years.

ANNEX 3 Linkages between the Objectives of CRP (research support) and CRPs

GENEBANK OUTPUTS	WHEAT CRP 3.1	MAIZE CRP 3.2	GRISP CRP 3.3	ROOTS, TUBERS AND BANANAS CRP 3.4	GRAIN LEGUMES CRP 3.5	DRYLAND CEREALS CRP 3.6	FORAGES CRP 3.7	TREES CRP 6
	Strategic Initiative 9: Seeds of Discovery	Strategic Initiative 8: Seeds of Discovery	Theme 1: Harnessing genetic diversity to chart new productivity, quality, and health horizons Product Lines 1.1 & 1.2	Theme 1 Conserving and accessing genetic resources Product Lines 1-5	Strategic Objective 1: Conserving and characterizing genetic resources and developing novel breeding methods/tools for improving efficiency of crop improvement Output 1 & part of Output 2	Strategic Objective 2: Enhancing the availability and use of genetic diversity, genomics and informatics to enhance the efficiency of dryland cereal improvement Major Output 2.1	Component 1.3 Feeds Outputs: Food feed crops; Specialized forages	Component 2: Management and conservation of forest and tree resources Research Theme 2 (example outputs below)
LTS & MTS maintenance of collections	3. Repository available as GPG	Collections held by CIMMYT and IITA are systematically and securely conserved, backed up, rationalized, kept transgene/ pathogen free, coordinated with other collections			Available and newly acquired genetic resources (at least 500 accessions) of grain legumes safely conserved	Conserving & distributing genetic resources zero in budget line	Appropriately conserved, maintained and phenotyped forage collection available for public use under appropriate international conventions	
Safety duplication				1.2.1.4 Improved methods for safety back-up of Musa conservation				
Regeneration & characterisation				1.1.12 Methodology for germplasm integrity assessment during *in vitro* storage developed (1.2.1.5 Musa, 1.3.1.2 Cassava, 1.6.1.1 Yams)				

GENEBANK OUTPUTS	WHEAT CRP 3.1	MAIZE CRP 3.2	GRISP CRP 3.3	ROOTS, TUBERS AND BANANAS CRP 3.4	GRAIN LEGUMES CRP 3.5	DRYLAND CEREALS CRP 3.6	FORAGES CRP 3.7	TREES CRP 6
Disease testing & cleaning collections				1.1.5.1 Efficient germplasm health monitoring and certification system to facilitate safe conservation and distribution (includes barcoding!) 1.2.5.1 Virus detection and eradication (Musa) 1.3.5.1-3 Protocol for establishing virus free germplasm, diagnostic tools, protocol for endophytic contaminants (Cassava) 1.4.1.4, 1.5.1.4 & 1.7.1.4 Optimized field genebank in term of sanitory quality (Potato, Sweet potato & ART) 1.4.5.1, 1.5.5.1 & 1.7.5.1 Improved endophyte protocols (Potato, Sweet potato & ART) 1.6.5.2-3 Protocol for establishing virus free germplasm & diagnostic tools (Yams)				
Introducing new accessions	1. New accessions from collecting missions integrated into genebank holdings responding to gap analysis 7. New germplasm added to fill critical ecological, national, and user-defined gaps in collection	New germplasm is added to fill critical ecological, national and user-defined gaps in collections, and to counterbalance in situ and on farm genetic erosion		1.1.2.1 Priorities identified for areas to be explored and material to be collected (1.2.2.1-5 Musa, 1.3.2.1 Cassava, 1.4.2.1-2 Potato, 1.5.2.1-2 Sweet potato, 1.6.2.1 Yams, 1.7.2.1-2 ART) 1.7.2.3 International collection of cocoyam assembled	Gaps in existing germplasm collections of at least 3 legumes identified Germplasm of cultivated and wild species of grain legumes collected/ assembled from the geographic areas rapidly eroding and/or less represented in existing collections	Enriching the collection with missing diversity zero in budget line		

GENEBANK OUTPUTS	WHEAT CRP 3.1	MAIZE CRP 3.2	GRISP CRP 3.3	ROOTS, TUBERS AND BANANAS CRP 3.4	GRAIN LEGUMES CRP 3.5	DRYLAND CEREALS CRP 3.6	FORAGES CRP 3.7	TREES CRP 6
Multiplication & dissemination	6. Seed from global wheat collections is made more easily accessible to wheat researchers, breeders and farmers worldwide			1.2.5.2 Increase exchange of bananas with B genome by better controlling BSV expression (Banana) 1.4.5.2, 1.5.5.2, 1.6.5.1, 1.7.5.2 Improved mass propagation and safe distribution system (Potato, Sweet potato, Yam & ART)	Grain legume germplasm supplied via SMTA (at least 5000 accessions) to researchers globally on request			
Managing information for accessions management and use	2. Phenotypic and molecular descriptions of conserved wheat diversity integrated with geo-referenced data via the WHEAT Diversity Portal 4. Data-mining results identify accessions carrying desirable traits made available via the Wheat Diversity Portal 5. Wheat Diversity Portal cross-linked with other wheat and IP-related internet resources to facilitate queries		1.1.4 Data management for quality assurance	1.1.4.1 Core common software for genebank management system including high quality standards applied across RTB international genebanks 1.2.4.2 Develop interface for access to evaluation data (Musa) 1.3.4.2 Transfer of digital images from characterisation activities into web sites (Cassava) 1.7.4.1 Collections of ARTC in Andean countries documented		Providing global access to genetic resources and related information (GRIN-GLOBAL) zero in budget line		Information systems and databases on genetic resources established or strengthened
GENESYS	7. CIMMYT and ICARDA-held wheat collections integrated into IT-facilitated global networks	CIMMYT and IITA-held maize collections are integrated into IT-facilitated global networks that enable users to contribute data and query germplasm across institutions		1.1.4.3 Information systems linked to global platforms (1.2.4.3. Musa, 1.4.4.2 Potato, 1.5.4.2 Sweet potato) 1.2.4.3 Improved access to Musa GR information				

GENEBANK OUTPUTS	WHEAT CRP 3.1	MAIZE CRP 3.2	GRISP CRP 3.3	ROOTS, TUBERS AND BANANAS CRP 3.4	GRAIN LEGUMES CRP 3.5	DRYLAND CEREALS CRP 3.6	FORAGES CRP 3.7	TREES CRP 6
Developing partnerships and exchange of services				1.1.2.2 Collections integrated in global conservation strategies 1.1.5.4 Germplasm safe duplication, multiplication, sanitation and distribution platform 1.4.1.1, 1.5.1.1 & 1.7.1.1 Dynamic in situ & *ex situ* conservation strategy and methodology fully developed (Potato, Sweet potato & ART)	At least one training course for NARS partners on genetic resources management conducted		Coordinated approach to food-feed crop work in the new CG including efficient networks that can phenotype for fodder traits	Global partnership frameworks for the evaluation and conservation of and access to tree crop germplasm for important traits established
Rationalization and optimiazation of collections	9. Accession subsets assembled and made available to users 10. New parental stocks and synthetics made available via marker-assisted pre-breeding pipeline	1. Phenotypic & molecular descriptions of conserved maize diversity generated adn integrated with geo-referenced passport data, and packaged and delivered to global maize community via researcher/ breeder-orientated MAIZE Diversity Portal. 2. Seed from global maize diversity collections is made more easily accessible to maize researchers, breeders and farmers worldwide (subactivities are described in cells above)	1.1.1 Sustained and enhanced management of rice collections of the CGIAR (CIAT, A.Rice, IRRI) zero in budget line 1.1.2 Enhanced conservation of the global rice gene pool (rescue and eliminate duplication) 1.1.3 Improved conservation of rice in genebanks (conservation research) 1.2.1 High resolution SNP genotypes of diverse accessions 1.2.2 A global phenotyping network for key agronomic traits and responses to major stresses,	1.1.1.1 Improved and validated MTS procedures (1.2.1.3 Musa, 1.3.1.4 Cassava, 1.4.1.3 Potato, 1.5.1.3 Sweet potato, 1.6.1.3 Yams, 1.7.1.3 ART) 1.1.1.2 Improved and validated LTS procedures (1.2.1.2 Musa, 1.3.1.1 & 3 Cassava, 1.4.1.2 & 5 Potato, 1.5.1.2&5 Sweet potato, 1.6.1.2Yams, 1.7.1.2&5 ART) 1.1.3.1 Core collections of RTB extracted based on molecular and phenotypic evaluation (1.4.3.3 Potato, 1.5.3.3 Sweet potato, 1.6.3.2 Yams) 1.1.3.2 Comprehensive collections with duplicates and off-types eliminated and unique accessions consolidated (1.3.3.1 Cassava, 1.5.3.2 Sweet potato) 1.1.4.2 Common RTB crop registries standards to be implemented across centres and crops and expanded to national and regional collections (1.2.4.1 Musa, 1.3.4.1 Cassava, 1.4.4.1 Potato, 1.5.4.1 Sweet potato, 1.6.4.1 Yams) 1.1.4.4 Linking morphological	Global legume phenotyping networks formed, priority traits, methods, research partners, and germplasm accessions to be characterized agreed upon Phenotypic data on targeted traits in structured and representative sets of germplasm of each legume species of the CRP Trait-specific germplasm made available using core/mini core, reference, and FIGS sets in at least five legumes Comparative performance of neglected species (e.g. P. coccineus,	Enabling better use of genetic resource collections (cores) zero in budget line Major Output 2: Identifying novel diverstiy Identifying traits of value for targeted improvement Refining high-throughput phenotyping procedure Obtaining genome-wide genotypic information Identifying trait-marker associations for more efficient breeding selection	Phenotypic screening methods available for germplasm characterization	Systems and procedures established for effectively conserving important genetic diversity Systems and procedures established for making important genetic diversity of tree crops available to breeders Methodologies/ standards for phenotypic and genetic characterization of genetic resources developed and agreed

GENEBANK OUTPUTS	WHEAT CRP 3.1	MAIZE CRP 3.2	GRISP CRP 3.3	ROOTS, TUBERS AND BANANAS CRP 3.4	GRAIN LEGUMES CRP 3.5	DRYLAND CEREALS CRP 3.6	FORAGES CRP 3.7	TREES CRP 6
		3. Elite germplasm with novel and useful introgressed genes/genomic regions from exotic accessions becomes available, allowing researchers/ breeders worldwide to improve key target traits and enhance genetic gains	including climate-change traits 1.2.3 Whole genome sequencing of all unique germplasm accessions held in the genebanks at IRRI, AfricaRice and CIAT and other genetic stocks 1.2.4 Specialised genetic stocks and novel populations through enhanced recombination of cultivated and wild rice gene pools	characters to molecular markers and genetic maps 1.1.5.3 Socioeconomic survey on germplasm use 1.2.3.3-5 Musa genetic resources characterised & evaluation, etc 1.3.3.2-5 Trait based reference set developed & other genotyping & evaluation (Cassava) 1.4.3.1-2 & 4-6 SNP marker kit, gene identification & evaluation (Potato) 1.5.3.1&4-7 SSR & AFLP marker kits, gene identification, genome sequencing & evaluation (Sweet potato) 1.6.3.1 Molecular based diversity analysis of common collections (Yams) 1.7.3.1-3 SSRs, AFLPS, Standard descriptors & evaluation (ART)	P. dumosus, P. acutifolius and V. subterranean) assessed in different environments for climate change-related traits			
Establishing and updating QMS, operations manual & staff retention plan								

ANNEX 4 Trust Staff to be Involved Substantively in the Plan's Implementation

- **PROF. CARY FOWLER**, Executive Director of the Trust, leads the organization and provides leadership and oversight in all areas. He is a former professor at the Norwegian University of Life Sciences. Prior to that he oversaw the drafting of the FAO State of the World's Plant Genetic Resources and its Global Plan of Action. He has represented the CGIAR in various negotiations and served on the CIMMYT Board.

- **DR. PAULA BRAMEL**, the Trust's new Assistant Executive Director will head proposal-related implementation efforts on a daily basis. Paula is a former professor of Plant Breeding (Kansas State University). She has practical experience in the genebank world, having been the director of the ICRISAT genebank. She came to the Trust in January, having served as the DDG-Research at IITA.

- **CHARLOTTE LUSTY**, Scientist, will devote most of her time to this project. Formerly at INIBAP / Bioversity, Charlotte was the central staff person working on the Consortium / Trust Costing Study. She particularly contributes expertise in the area of vegetatively-propagated crops and in costing and management.

- **JANE TOLL**, Project Manager, was the first and long-time leader of the CGIAR System-Wide Program on Genetic Resources before she moved to the Trust in 2006 to head its large Gates-funded project which established partnerships in 90 countries and accomplished the regeneration of 90,000 threatened genebank accessions in 40+ countries. She was an early staff member of IBPGR.

- **LUIGI GUARINO**, Senior Scientist, has a rich history in the field, including long stints living and working in Africa, Latin America and the Pacific, and is familiar with both many crops and many genebank programs inside and outside the CGIAR. He is editor of the standard text on plant collecting published by CABI.

- **DR. GEOFF HAWTIN** serves as Senior Advisor to the Trust on a one-third basis. Geoff is former DG of IPGRI (Bioversity) and CIAT, and currently chairs the board of CATIE. He was a former Director at IDRC and a DDG at ICARDA. He offers a wealth of practical CGIAR experience in advising the Trust.

- **ANNE CLYNE**, a chartered accountant formerly with KPMG and the International Development Law Institute, and since 2005 the Director of Finance at the Trust, will provide assistance in evaluating budgets and financial reports.

In addition, the Trust will allocate secretarial and clerical staff time.

Much of the actual staff time devoted to the Plan by the Trust will be provided in-kind by the Trust through its own funds.