

FOR INFORMATION

The Road Ahead: 2009 and Beyond

Purpose

- To provide Members with an analysis of the current scientific and political context in which the Trust operates.
- To identify and assess strategic challenges and opportunities.
- To present an overview of the proposed 2009 programme activities in addition to possible new initiatives to support development of a Global System.
- To consider and approve the 2009 work plan, including possible long-term support for three additional crop collections.

Background

At EB1, Members discussed and affirmed the Trust's support of the strategic analysis and directions laid out in the paper, "The Role of the Trust in Helping Ensure the Long-term Conservation and Availability of PGRFA," which had previously been considered and endorsed by the Interim Panel of Eminent Experts. This document (available at: <http://www.croptrust.org/documents/web/RoleofTrustSept08.pdf>) sets out a vision of how a rational and sustainable Global System might be constituted, and it enunciates the questions and considerations the Trust will bear in mind when making specific programmatic and funding decisions. The paper contains a "decision tree" to assist in separating effective and rational funding allocations from those that are either unnecessary or inefficient.

The Trust's mandate and strategic direction are fundamentally derived from the International Treaty (with 116 Parties), the FAO Global Plan of Action (adopted by 150 countries), the Trust's own Constitution and its Relationship Agreement with the Governing Body of the International Treaty. These documents provide an unmistakable strategic direction for the Trust. "The Role of the Trust" draws on each, translating them into a more operational framework for programmatic action. The "Fund Disbursement Strategy" (Paper 11) presented in draft form for consultation with the Donors' Council and the Governing Body of the International Treaty, likewise sets out a strategic direction consistent with the aforementioned documents' call for the creation of a rational, effective, economically-efficient and sustainable global system. It acknowledges that funding decisions must be made pragmatically and with a view towards maximizing impact in the context of there being inadequate funds to satisfy all non-prioritized needs and desires.

In his first major presentation to the Board at EB1, the Executive Director explained these strategic bases and assumptions upon which the Trust had operated up until that point, and he identified the major risks, as he saw them, to the achievement of the Trust's goals. Amongst these included:

- Possible lack of cooperation, and even possible political opposition to or interference with the Trust's commitment to provide funding only for activities that are most necessary to the development of a rational global system and most widely beneficial (as opposed to having more relaxed funding criteria that would allow all

PGR-related activities – including those that are primarily national in orientation and impact - to qualify for funding).

- Major swings in investment returns that unless properly managed could undermine the Trust’s ability to meet its obligations or undermine donor confidence in the endowment fund approach.

Both risks were identified early and steps were taken to address them, but mitigating either completely lies beyond the power of the Trust.

Towards a Rational System

This paper examines the goals and strategy of the Trust, placing the risks associated with bullet point 1 (above) in that context. It outlines programmatic activities for the coming year, including the possibility of additional long-term grants for specific crop collections. And, it identifies several major new programmatic initiatives that the Trust could pursue, subject to its raising additional funding for them. Bullet point 2 is dealt with separately under other agenda items.

The Trust is focused on building a rational global system for conserving and making crop diversity available. Rational in what way?

- Rational viewed from a *global* perspective. This means that we are building *one* system, not a separate system for each country or region. More explicitly, this means a globally cooperative approach and a division of labor determined by efficiency, effectiveness and sustainability. It also means that the goal is to conserve diversity, not necessarily to protect, conserve or support all the different institutions and institutional arrangements existing in the profession.
- Rational *economically*. This means that we take into account existing infrastructure and capacity and do not attempt to duplicate it unnecessarily.
- Rational *scientifically*. This means that we focus on unique samples (as opposed to all samples) and attempt to manage them in the best, most practical manner possible. More explicitly it means that each unique sample is held in two genebanks (at least one of which manages it reliably and consistently according to international standards) plus the Svalbard Global Seed Vault.

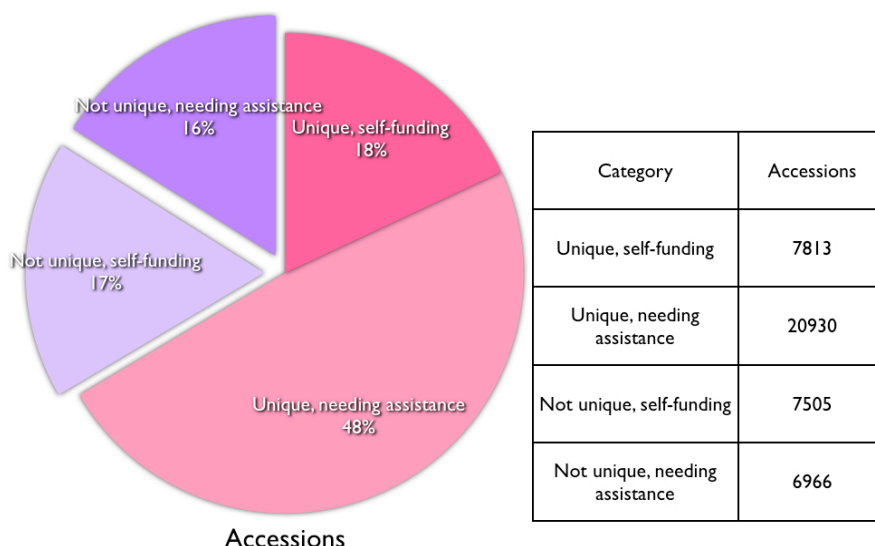
In establishing the goal of having a rational global system, the International Treaty implicitly recognizes that the current collection of ad hoc activities constitutes neither a rational nor a global system, much less the combination. The Treaty explicitly requires countries to cooperate. This cooperation – providing the basis for a concrete departure from “business as usual” - is a prerequisite for the creation of a rational global system that is effective and sustainable. Likewise, it is a prerequisite for the success of the Trust’s initiatives in supporting this goal of the International Treaty and the Global Plan of Action.

How would a rational global system differ from the current situation? And, why isn’t better funding of all existing activities the solution? Is the rationalization of current activities really necessary for the creation of a rational global system?

These questions are best explored through a practical example. The following figures examine one crop, lentil.

As the Figure 1 shows, lentil collections include those that are self-funding and not, and those that are comprised of unique accessions and those that are not. And, were we to look more closely, it would include those that are housed in facilities that manage them according to international standards, and those that do not. Finally, there are institutions able and willing to cooperate – to provide access, to safety duplicate, etc. – and those that are not.

Figure 1. The world’s lentil collections

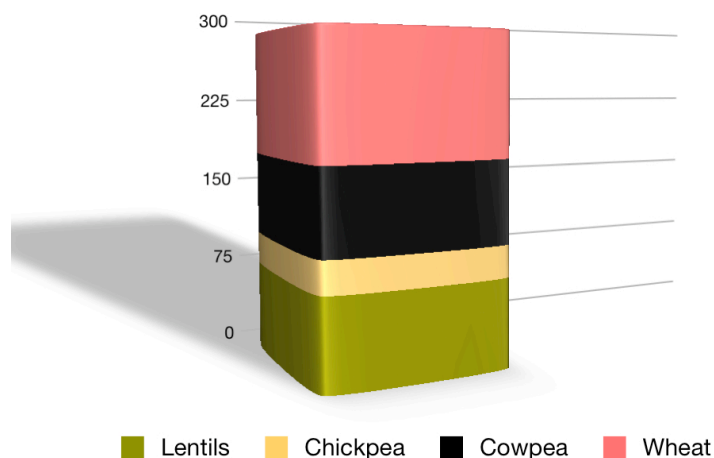


The pie charts visually assist us in determining which collections provide the backbone of a global system, and of these, which are needful and worthy of Trust support.

A global system for lentil, however, cannot be synonymous with a global system for all crops. Crop-by-crop the relevant institutions will differ. The key institutions for managing wheat or potato diversity will not necessarily be those that are central to a system designed for lentil. Thus, a rational global system for PGRFA cannot simply be constructed by adding together the systems associated with each crop – it cannot be constituted by adding a wheat system to a lentil system and adding these to a potato system, etc. Why? Because the number of institutions involved would be too large; the infrastructure too extensive; the costs much too high to be met and sustained. Were this approach even attempted, the Trust would find itself supporting a huge number of genebanks together with their entire physical infrastructure, for the purpose of conserving a plethora of tiny collections of a single crop. On a per-accession basis, the cost would be astronomical. Such a “strategy” would obviously not produce the rational, efficient, effective and sustainable global system that is the goal of the International Treaty and Global Plan of Action. Nor is it within the financial capabilities of the Trust, regardless of the attitude the Trust might have towards the merits of such a “system.”

Figure 2 illustrates these points. It shows the number of institutions holding lentil. And, it adds to it the number of additional institutions holding chickpea, then cowpea, and then wheat. Were one to continue the exercise, including all PGRFA, the number of institutions would eventually exceed 1000. This set of figures demonstrates why it will be necessary in any rational global system to concentrate the responsibility for long-term storage on a scientifically-necessary and economically-feasible number of facilities.

Figure 2. Number of institutions holding lentil, chickpea, cowpea and wheat collections



Having negotiated and ratified the International Treaty, most countries will support the Trust's efforts to strength global efforts to manage crop diversity, even if this does not mean that each of more than 1000 facilities is upgraded to international standards and furnished with long-term financial support, an unattainable goal of dubious merit in any case.

However, some countries may take a different view. During 2008, some genebanks were unwilling to partner with the Trust, or to accept Trust funding for regeneration of threatened collections in their genebanks, because:

- (a) Trust contracts called for the targeted accessions to be made available under the terms and conditions of the International Treaty; and/or
- (b) Trust contracts required the targeted accessions to be safety duplicated outside the country and in Svalbard.

Lack of commitment on the part of some to the basic scientific tenets of a global system, or even to the principle of "facilitated access" as found in the Treaty, will obviously impair the ability of the Trust to fulfill its mandate.

In each case, the Trust has engaged in extensive discussions in an effort to convince collection holders of the necessity and value of cooperating to build a global system. But, in several instances, discussions have failed to produce an agreement, and this lack of agreement may in turn generate some animosity towards the Trust that will surface in political fora in the future. The Secretariat proposes quite simply that the Trust not abandon the principles of the Treaty and the Global Plan of Action, nor that it compromise in its support of sound management practices. A change of direction in either area would undermine construction of a global system, dramatically increase the size of the endowment the Trust would need to assemble, and put the organization at odds with the majority of Parties to the International Treaty as well as the majority of Trust donors. Instead, the Trust should link itself with those that are willing to build a new cooperative global system consistent with the terms and the goals of the International Treaty. The Trust will therefore continue to work in partnership with national programs, international institutions such as the CGIAR, and with the Secretariat of the International Treaty to ensure implementation of the Treaty and achievement of common goals.

The Program

The Trust's program can be broken down into two major components:

- Securing and Conserving (collecting, regenerating, storing, upgrading facilities, etc.)
- Understanding Diversity and Promoting Use (evaluation of diversity, information systems, distribution of samples, pre-breeding, etc.)

In addition, the Trust is heavily involved in raising public awareness, and in various institution-building efforts such as fundraising.

Most of the 2009 program has been set in advance by (a.) the agreed activities associated with the UNF/Gates-funded project, and (b.) previous long-term commitments made for funding of 13 crop collections. The Executive Board has discussed these previously, and extensive documentation is available. Item 7 provides an update of progress to date. What follows here is a brief summary of activities to be undertaken in 2009.

Securing and Conserving

Collecting. Working in partnership with CIAT with funds provided by GRDC, the Trust is currently developing a methodology for the more efficient targeting of collecting. In 2009 the Trust will call for applications based on the aforementioned methodology, and develop grant agreements for projects for collecting focused on 12 crops in Africa and other regions of the world particularly at risk from climate change. The high priority gaps for collecting, identified through the scoping/methodology study undertaken in 2008 will form the main basis for selecting the submitted proposals under a competitive grants scheme. The aim will be to target hotspots where crop genetic resources are threatened and where gaps occur in collections, giving particular emphasis to crop wild relatives.

Long-term grants. Three new proposals for 2009 are before the Board for consideration. Each of the crops being proposed for long-term funding is a new addition. All three represent important food staples in their region and are globally significant food crops. The Centers that house these in-trust collections do so under the terms of the International Treaty on Plant Genetic Resources for Food and Agriculture and the germplasm are available to plant breeders worldwide. In addition, the Trust is proposing to increase the existing long-term grant for rice by US\$50,000.

Subject to Board approval of the 2009 long-term grants, Agreements will be in place for 13-16 crops with 9-10 genebanks to support their annual running costs for conservation and distribution of germplasm and to further the development of the global system. We expect to initiate the first round of Agreements with non-CGIAR genebanks.

As the "change process" comes into effect within the CGIAR and the global system gradually takes form, the costs of genebank operations will continue to be revisited. The Trust is following these developments closely. They are of obvious concern to the Trust, both because the Trust wishes to promote an efficient and sustainable conservation system, and also because budgets for key components of the global system determine the endowment level the Trust needs to attain in order to achieve its goal of ensuring the conservation and availability of unique diversity in perpetuity.

We note with concern that CGIAR genebank budget estimates differ substantially between the different genebanks, and within individual genebanks over relatively short periods of time. This is leading to uncertainty concerning "real" costs. In order to ascertain the financial resources required to ensure conservation and availability of these important

collections, the Trust would hope that agreement could be reached within the CGIAR system on a agreed set of basic activities that could be costed uniformly, and that any large variances between Centers holding similar crops might be examined with a view to rationalizing activities and minimizing long-term costs.

Upgrading. Activities to upgrade and regenerate accessions at the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Costa Rica) and the World Vegetable Centre (AVRDC, Taiwan & Tanzania) will be under way during 2009.

Regeneration. Regeneration contracts should be finalized with all partners who have been identified and have accepted our contractual conditions. We expect to be working with 48 holders of priority collections and 9 regional plant genetic resources to regenerate and characterize 100,000 accessions. Regeneration guidelines for 21 crops will be completed, published and circulated to collection holders. The Trust team will be working with Bioversity and other CGIAR Centres to ensure that adequate backstopping is provided to all partners. Special attention will be given to those collection holders who have been highlighted in the proposal development phase as needing assistance.

Cryopreservation. Materials of 4 crops (yams, aroids, cassava and sweet potato) to be tested will be multiplied and shared, and the most suitable protocols and variables for testing will be identified for the implementation of the cryopreservation project. In April 2009, a cryopreservation symposium to be held in Leuven, Belgium, will provide a venue for the researchers from all six partner institutes to meet and exchange information on techniques and practices. Some initial indications should be available by the end of the year as to the feasibility of using cryopreservation on some of the more recalcitrant genotypes, for instance of cassava. More than half the target banana accessions (250) from the global in-trust collection will be prepared for cryopreservation at both the Katholieke Universiteit Leuven in Belgium and the National Bureau of Plant Genetic Resources in India.

Safety duplication. By the end of 2009, duplication plans will be in place for all partner institutes undertaking regeneration. The accessions planted in 2008 will be harvested and characterized as appropriate, and the first shipments of safety duplicates will be received by the chosen host genebanks. The receipt of shipments will represent a significant outcome for those countries that are using the Standard Material Transfer Agreement for the first time or, in twelve cases, implementing the Solemn Undertaking with the Trust to abide by the same conditions. CGIAR Centres and other genebanks will make additional seed deposits (with Trust funding) to the Svalbard Global Seed Vault. And, the first deposits of material regenerated under Trust funds will be made.

Understanding Diversity and Promoting Use

Evaluation. The Trust has a competitive grants program for the screening of collections for traits of relevance to climate change and for the poor. We initiated the program in 2008. More than 100 applications for funding were submitted. Initial results from the 11 projects underway from the first call under the evaluation scheme will become available in 2009. The two projects delayed pending agreement on contract terms will, it is hoped, go forward in 2009. The effectiveness of different approaches for testing drought resistance may be shared between grantees. A second tranche of approximately 20 grants funded through UNF/Gates will be approved and research commenced.

Information. The first version of the curator interface of an easy-to-use state-of-the-art genebank data management system, based on GRIN, will be unveiled and tested and a second version developed by the end of 2009. The global accession-level information system (ALIS) will be under development under the guidance of an international advisory

committee. A prototype portal for searching across the information systems of the international collections held by the CGIAR Centres (SINGER) and European collections (EURISCO) will be put in place during the year.

Distribution. The Trust expects that the collections it funds on a long-term basis will, in most cases, provide the largest number of samples to plant breeders and researchers internationally of any genebanks in the world. The regeneration initiative, and the work done on information systems, should dramatically increase access and use of these genetic materials.

Pre-Breeding. Further pre-breeding training courses will be held under FAO's GIPB. Projects for pre-breeding work and bioenergy crops selected for funding in 2008 will get under way in 2009, and additional projects will be identified and funded through a competitive grants scheme.

Future Programmatic Initiatives

Consistent with its mission to ensure the conservation of unique crop diversity through a rational, effective and sustainable global system, the Trust must continually reassess needs and opportunities. In recent months, discussions within the staff and with partners have led to the identification of several areas in which the Trust might take the lead, making a major impact both in terms of conserving diversity and building a global system. In large part, this thinking grows out of the "lessons learned" from the current Trust program, and the desire to enunciate a vision of what could be accomplished if only we were to think boldly *and* pragmatically.

The Trust proposes to initiate a broader discussion of these possible programmatic initiatives within the PGRFA community and amongst donors with the aim of mobilizing the necessary scientific, political and financial support.

1. *Vision: That we "endow" and successfully complete the job of ensuring the conservation of one or more crops, in perpetuity, in the next two years.*

Background. The Trust, with partners, has made substantial progress in securing globally important collections. It has not yet "completed the job" with any particular crop, by putting together the genetic resources with the necessary institutions and the necessary funding. Moving towards this goal would provide valuable lessons for the Trust and the wider PGRFA community. It would also demonstrate that our goals are actually achievable. Realizing such an ambitious goal, however, implies that we successfully construct a rational conservation system for the particular crop, a system that remains rational and sustainable in the context of efforts with other crops.

Programmatic direction. The Trust will continue to seek to identify funding sources, including high net worth individuals, potentially interested in endowing a particular crop.

2. *Vision: That we collect and conserve the remaining wild relatives of the major cultivated crops within 5 years.*

Background. A huge amount of genetic diversity lies – largely untapped – in wild populations of crop relatives, where new genetic combinations continue to be selected in the face of advancing pests, diseases, and climatic and other environmental pressures. Historically, improvement programs have incorporated materials from wild crop gene pools relatively infrequently. The use of wild species has been limited not only because of technological constraints, but also because breeders have had little access to both the germplasm and knowledge of its potential use. Wild species are not well-represented or

documented in most *ex situ* collections, and where they are conserved they generally demand different regeneration procedures than cultivated accessions and are more vulnerable to being lost.

As just noted, genebanks are notoriously deficient in terms of their collections of the botanical relatives of cultivated crops. For a number of these species, genebanks hold no samples whatsoever. The greatest amount of uncollected and unsecured diversity lies within these wild relatives. This diversity clearly is a treasure trove of traits such as disease and pest resistance, drought and heat tolerance, etc. In the natural environment, this diversity is highly threatened by development pressures and climate change. Scientific and technological advances are making it more and more feasible to use this diversity in breeding programs. The Trust, in partnership with other institutions, has been developing a methodology that for the first time makes it feasible to undertake a major global initiative to collect, conserve and use this rich source of diversity in a targeted and cost-efficient manner.

Programmatic direction. With funds from the GRDC (Australia), the Trust is developing a methodology that seeks to identify genetic diversity missing from current collections which is threatened and which may be of potential value, for example in the context of future climate change. By subjecting the data we have about current genebank collections and what is known about the natural ranges of wild relatives to a series of screens (e.g., GIS, development pressures, future climate, etc.), we should be able to identify rather precise areas where collecting would be most productive.

Figure 3 shows the natural distribution of wild species of *Vigna* (cowpea) in Africa. Clearly, collecting diversity from such a wide area would be prohibitively expensive and time consuming. As overwhelming as this might seem, it only represents the challenge posed by one crop. Figure 4, however, shows how collecting priorities can be focused when one uses data to identify where one might find new diversity (traits not already found in genebanks) that is both potentially threatened and potentially useful. Suddenly, it becomes possible to prioritize and feasible to collect.

Figure 3. Natural distribution of high priority wild species of *Vigna* (cowpea) in Africa

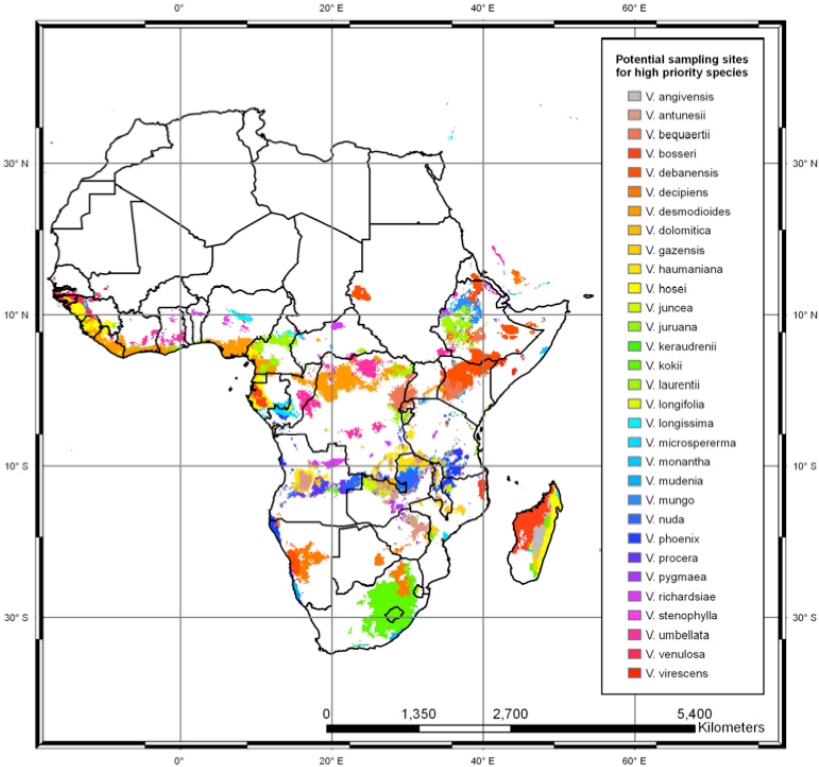
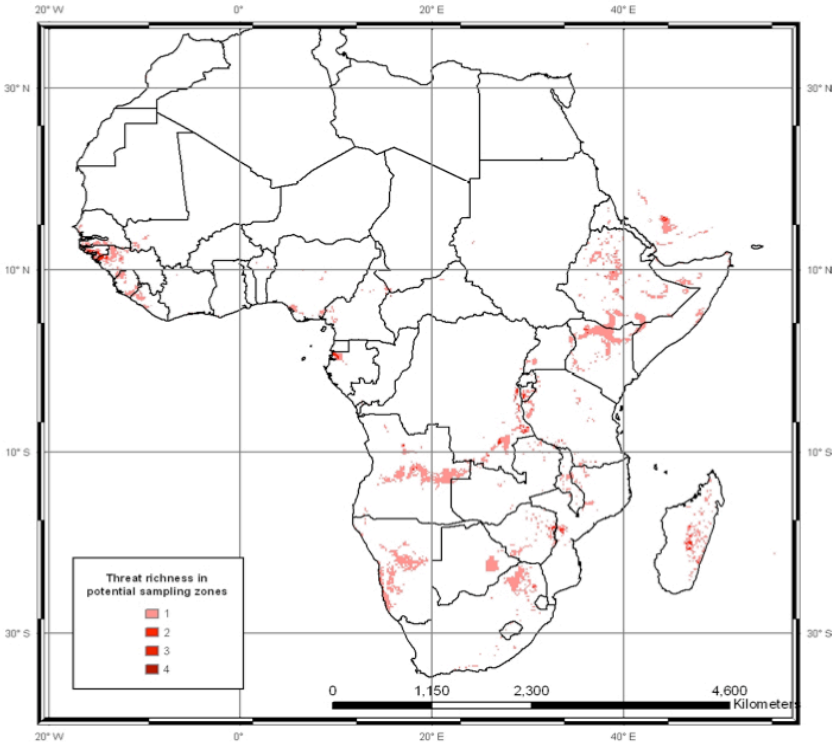


Figure 4. Priority collecting areas based on threatened ecosystems



We envisage deploying the dual thrust of developing information resources on wild species and improving their security in long-term conservation. Through information and training their use in pre-breeding and breeding efforts would also be promoted. The initiative would involve a multi-disciplinary approach bringing together expertise from plant conservation and crop research fields to ensure that (1) collecting is prioritized and carried out on the basis of sound taxonomy and population genetics; (2) the most advanced techniques are deployed for long- and medium-term conservation appropriate to wild seed or plant samples; (3) collected samples are comprehensively characterized using molecular markers, ecological characterization and descriptors that are adapted and relevant to wild species; and (4) the deployment of wild species in breeding is promoted through training, especially in pre-breeding, and the innovative use of information.

3. *Vision: That we devise and implement an economical strategy to collect and conserve the diversity of major root and tuber crops and that we complete this job within 10 years.*

Background. Root and tuber crops are inordinately important to the poor and to food security. In times of rapidly increasing food prices, the poor depend more on these locally grown and consumed staples. Furthermore, most are true “orphan” crops, receiving inadequate investment relative to their value in the food system. Conservation of root and tuber crops has been less secure than seed crops because of the vulnerability of field collections and the high cost of managing these collections (due to labor costs, disease-indexing and cleaning, and the substantial initial costs of transferring materials into *in vitro* conservation or cryopreservation). Prevailing wisdom calls for the conservation of all genotypes – all “unique” gene combinations without regard to whether the genetic diversity itself might already be conserved in existing genotypes. This approach mandates the costly conservation of numerous samples (unique combinations of genes) without necessarily expanding the genetic coverage (unique genes) of the collections. The sheer cost and impracticality of this approach means that the job never gets done, and there is an *ad hoc* nature to what actually gets conserved. Meanwhile, more pragmatic and beneficial approaches are eschewed.

Programmatic direction. The Trust proposes a more rational, pragmatic and achievable approach to conserving and making available both genotypes and genes of roots and tubers for the long-term.

The elements of this proposal include identifying and filling important gaps in the international collections, the characterization of collections using both morphological and molecular markers, and the active elimination of duplicates to reduce costs. Rationalized collections would be disease indexed and cleaned so that the most sought-after or relevant accessions are available for use.

This approach would stratify conservation efforts so that the best possible representation of unique and valuable genes is secured for the long-term. A “core+” collection would be identified within the global system, consisting of both cultivated and wild types that represent the array of diversity contained in the crop gene pool, together with additional *readied* materials identified as relevant for climate change, disease resistance or other special traits (e.g., micronutrients).

The core+ will be the focus of cryopreservation efforts and any other high-cost conservation related work or research. The responsibility for the conservation of accessions not in the core+ may then be shared between partners in the global system using a combination of conservation methodologies in a complementary fashion, with the aim of maximizing availability and use (i.e. seed conservation, tissue culture, field collections). To give these ideas concrete form, the community of experts for each crop will need to be engaged and

the process and roles of different players in the global system established. There will also be a need for additional research or validation of conservation techniques, for instance for the production and conservation of seed, virus cleaning and cryopreservation of recalcitrant types.

The end result of this work will be a conservation system that focuses on unique diversity in a cost-efficient manner and in a form that makes the diversity available for access and use.

4. *Vision: That we launch a global initiative to identify significant untapped traits within collections in order to prepare crops for climate change and other challenges.*

Background. The funding from GRDC and UNF/BMGF, as well as collaboration with the Generation Challenge Programme and Global Partnership Initiative for Plant Breeding Capacity Building (GIPB), is providing new opportunities to advance and coordinate efforts to evaluate landraces, wild species and other materials in genebanks. The need for this is becoming acute as we struggle with the challenge of “getting agriculture ready” for climate change and major biotic and abiotic stresses. However, it is clear that the resources available are woefully inadequate in relation to the need, and that one reason for this lies in the lack of a practical vision for how to organize, coordinate and prioritize the work in order to make goals concrete and achievable.

Programmatic direction. The Trust proposes a systematic global initiative to identify germplasm to address specific challenges (e.g. decreasing yields due to climate change). Our belief is that using a coordinated or network approach between institutes working on the same traits and materials in different sites will produce more solid and significant results. Hence, we suggest a series of multi-site evaluation programs for landraces and wild materials of different crops linked intimately not just to pre-breeding and breeding programs, but also to active seed systems. These would be targeted in areas and to crops that are most threatened or are most likely to benefit, e.g. maize in southern Africa.

The process of formulating the proposal for the development of information systems for accession level data, and indeed also the evaluation work, has highlighted the need for a more concerted effort to gather, harmonize and validate datasets and develop the tools that will help to create effective demand for diversity. The vision here is to develop an “Amazon.com” for germplasm, where any user can view varieties of interest, perhaps suggested by the system itself, access consolidated information of high quality and relevance, order the germplasm, and then perhaps leave comments on its use. Passport and characterization data will be brought together in ALIS. More importantly, in the process of developing ALIS, a culture of sharing and viewing data online among institutes conserving and using germplasm worldwide will be gradually forming. Hopefully building on a growing realization of the usefulness of this facility and a desire to benefit from the visibility, institutes will voluntarily contribute new data. The efforts devoted to ALIS will be extended to improve the quality and coherence of the data from the viewpoints of different kinds of users, and to include good-quality evaluation data. An intelligent search capability and the full deployment of Web 2.0 technologies will allow users to hone in more precisely on the material they need, and exchange information about it.

Action

That Members consider and approve the work plan for 2009 set out in this paper, and that they consider and endorse the new initiatives, subject to availability of new funds that the Trust would seek to raise for these purposes.

