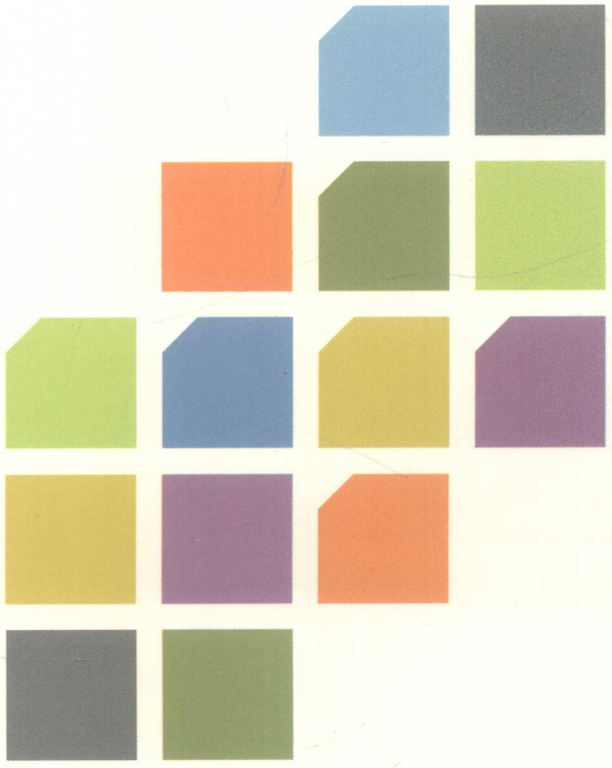
SYNTHETIC ACCOUNT OF THE SECOND GLOBAL PLAN OF ACTION
FOR PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
FAO, 2012

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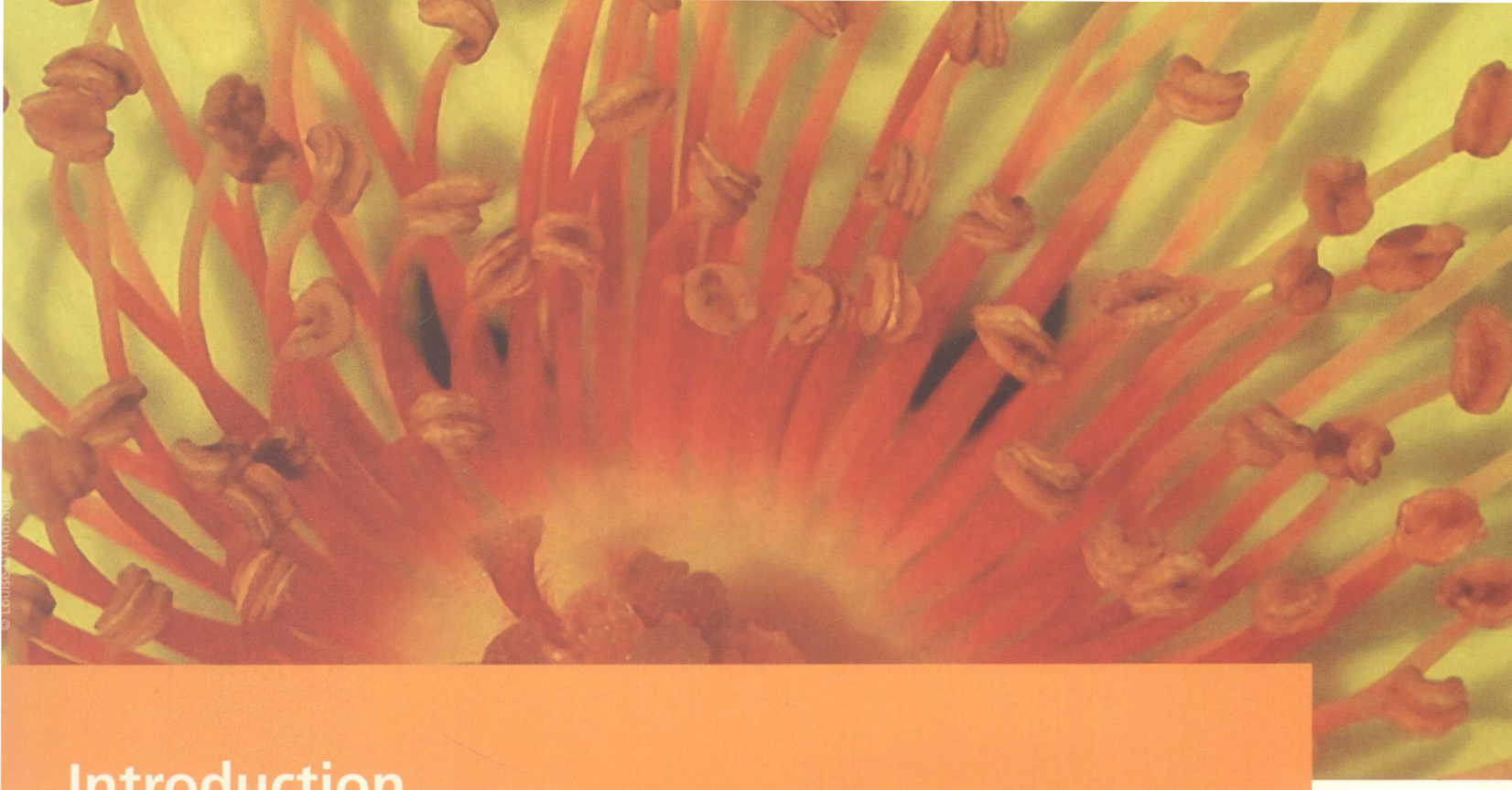


Introduction

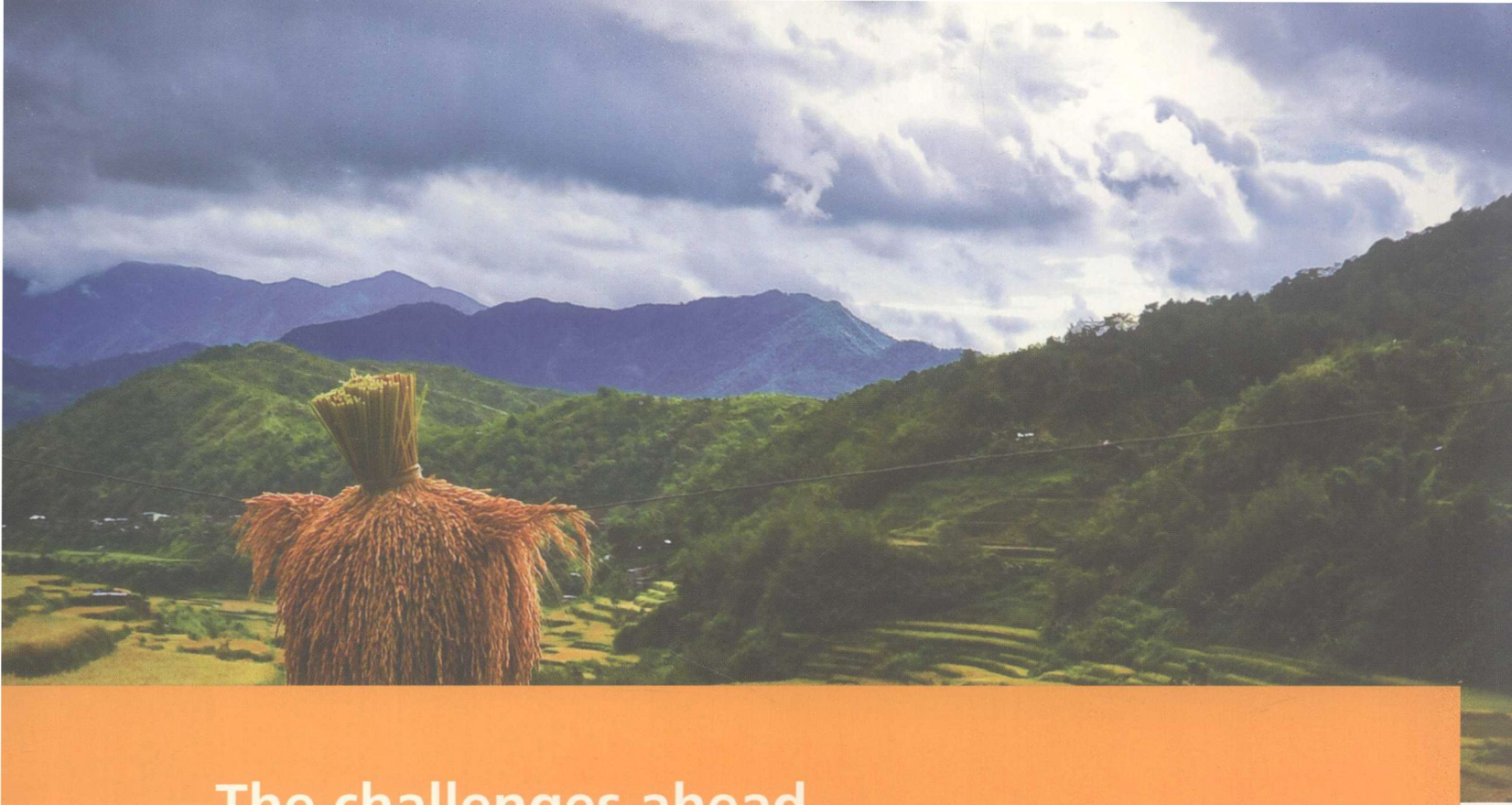
Plant genetic resources for food and agriculture (PGRFA) embrace the diversity within and between crops and their wild relatives. This diversity has evolved over thousands of years in a dynamic interaction between nature and agriculture. Plant genetic resources provide the biological basis of world food production and security and hence contribute to economic development. By serving as building blocks for farmers and breeders to develop new plant varieties, PGRFA are an insurance for agriculture to overcome future challenges, such as climate and other environmental changes and increasing food demand.

The FAO Commission on Genetic Resources for Food and Agriculture (the Commission) was established in 1983 as a forum to deal specifically with issues related to PGRFA. In 1995, its mandate was broadened to cover all genetic resources for food and agriculture. In the 1990s, the Commission guided FAO in the first ever assessment of the *State of the World's Plant Genetic Resources for Food and Agriculture*, and led negotiations that culminated in 1996, when 150 countries adopted the rolling Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. As the first framework to succeed in integrating conservation and utilization activities, the Global Plan of Action also recognized the crucial roles played by farmers, seed curators and breeders in managing these resources.

The Commission, at that time, agreed that FAO should periodically re-assess the state of the world's PGRFA to facilitate the analysis of changing needs and gaps, and to contribute to the adjustment of the Global Plan of Action. The *Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture* (Second Report) was launched by FAO in 2009. In response to the findings of the Second Report, the Commission updated the Global Plan of Action. The FAO Council, as mandated by the FAO Conference, adopted it as the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture (Second Global Plan of Action) in 2011.

This synthetic account conveys the main messages of the Second Global Plan of Action and its priority activities. Unlike the Second Global Plan of Action, it has neither been negotiated nor approved by the Commission or any other body of FAO. For more detailed information on the adopted priority activities reference is made to the Second Global Plan of Action itself.[1]

1 http://www.fao.org/docrep/015/i2624e/i2624e00.pdf



The challenges ahead

The world's population is growing by an estimated 80 million people per year. A 60 percent increase in world food production over current levels will be needed to feed us all by 2050. Besides, the number of undernourished people has grown steadily in the last 15 years – from just under 800 million in 1996 to 925 million in 2010. The increased food insecurity is reflected *inter alia* in highly volatile food prices. Globalization and rapid urbanization are influencing consumption patterns, including the replacement of traditional diets with foods that are higher in energy and fat.

To ensure the food and nutrition security of all people – particularly poor people in developing countries, who will be hardest hit by any food shortages – a better use of a broader range of the world's PGRFA is of pivotal importance. Farmers will need nutritious crop varieties that can yield more under diverse conditions, without ever-increasing amounts of fertilizers and other agrochemicals. Because of the limited scope for growth in the world's cultivated areas, each new generation of varieties will have to be more productive than its predecessors.

Climate change poses another challenge to the world food supply. Greater weather variability, warmer temperatures, shorter growing seasons, shrinking water supplies and new pests and diseases will place unprecedented stress on agricultural systems. As weather patterns change, the most diverse systems – those that have and use the most crop diversity – are likely to be the most adaptable. Growing a range of local crops and varieties can help adapt to climate change by maintaining ecosystem resilience. Consequently using PGRFA to develop crop varieties that can survive pests and diseases, heat, drought, flood and other extremes of weather is essential for adaptation of agricultural systems to climate change.

Whereas crop diversity is a powerful tool for adaptation to changing environmental conditions, it is also under considerable threat, including from climate change. Higher temperatures will reduce crop yields, limit or change areas available for crop production as well as threaten crop relatives growing in the wild. This places significant, new pressures on crop diversity that was already at risk: in the past 50 years, genetically uniform crop varieties have replaced many thousands of local varieties over huge areas of production.

Why a Second Global Plan of Action for PGRFA?

The growing challenges we face today – famine and malnutrition, rising food prices, population growth and climate change, among others – have made the conservation and sustainable use of PGRFA even more pressing than ever, thus reinforcing the importance of the Global Plan of Action. Since the Global Plan of Action was formulated and adopted in 1996, substantial changes have occurred which have made it necessary to update the Global Plan of Action:

- New **developments and trends in agriculture**, such as the increase of international seed trade, have significant impact on the conservation and use of PGRFA.

- Over the past 15 years, considerable information has become available on the **extent and nature of the genetic erosion** and vulnerability of PGRFA. Strategies for the conservation and use of PGRFA should fully take into account most recent findings regarding the major causes of genetic erosion, which include replacement of farmers' varieties/ landraces, land clearing, overexploitation, reduced water availability, population pressures, changing dietary habits, environmental degradation, changing agricultural systems, overgrazing, legislation and policy, pests, diseases and weeds.

- Since 1996, major **advances in key areas of science and technology** and the **growing interest in new products** derived from agriculture – such as biofuels – have increased both the means and the incentives to conserve and use crop diversity. These advances include the rapid development of information and communication technologies and of molecular and genomic methods. They allow for the generation of additional and much more detailed information as the extent and distribution of genetic diversity and can be used in the development of strategies for the conservation and use of PGRFA.

- **Climate change** is now recognized as an immediate and unprecedented threat to livelihoods and food security. Growing attention is therefore being paid to crop diversity, in particular crop wild relatives and traditional varieties, as raw material for crop adaptation.

- During the past 15 years, there have been major **policy developments** with impact on the conservation, use and exchange of PGRFA. Undoubtedly, the most important one has been the International Treaty on Plant Genetic Resources for Food and Agriculture which entered into force in 2004. Through its Multilateral System, the International Treaty facilitates access to

PGRFA and allows the fair and equitable sharing of benefits arising from their use. The Global Plan of Action provides the technical blueprint for the funding decisions of the International Treaty and the Global Crop Diversity Trust also established in 2004. The tenth meeting of the Conference of the Parties to the Convention on Biological Diversity adopted a revised and updated Strategic Plan for Biodiversity for the 2011-2020 period, which the United Nations General Assembly declared the United Nations Decade on Biodiversity, with a view to contributing to the implementation of the Strategic Plan.

The Second Report, published in 2010, provided a solid basis for updating the 1996 Global Plan of Action. In addition, a series of consultations in all regions, as well as inputs from experts, helped ensure that the Second Global Plan of Action is current, forward-looking and relevant to global, regional and national decision-makers and stakeholders. Its adoption by the FAO Council on 29 November 2011 reflects the world community's continued commitment to improving the conservation, use and exchange of plant genetic diversity to tackle the new challenges and embrace new opportunities that have emerged since 1996.

This synthetic account provides a brief overview of the 18 priority activities of the Second Global Plan of Action, which are organized into four main groups, namely:

- *In Situ* Conservation and Management
- *Ex Situ* Conservation
- Sustainable Use
- Building Sustainable Institutional and Human Capacities

Priority activities of the Second Global Plan of Action

In situ conservation and management

The conservation of PGRFA in natural ecosystems and their on-farm management provide for the continued evolution and adaptation of these resources to changing environmental forces, and thus for the generation of new diversity that is important for future crop improvements. Farmers and indigenous and local communities play a critical role in the development and conservation of plant genetic diversity *in situ*, especially on farm.

1. Surveying and inventorying plant genetic resources for food and agriculture

Knowledge of the existing crop diversity, its distribution and evolution over time is an essential pre-requisite for developing effective and efficient PGRFA management strategies. A number of PGRFA surveys have been carried out over the past decade; however, they have usually been restricted to single crops or small areas and efforts to inventory plants in protected areas have been quite limited.

This priority activity aims to facilitate the development, implementation and monitoring of complementary conservation strategies and national policies related to the conservation and sustainable use of PGRFA. It also aims to improve and apply methodologies, including geographic information systems (GIS), remote sensing and molecular markers, for surveying, inventorying and assessing threats to PGRFA. Surveying and inventorying will require stronger links between ministries of agriculture and environment, both nationally and within regions. Indicators are needed to monitor changes in the distribution of diversity and to aggregate information on individual species and populations. Indigenous and local knowledge should be recognized as an important component of surveying and inventorying PGRFA, and carefully considered and documented where appropriate and with the prior informed consent of indigenous and local communities.

2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture

Farmers grow modern varieties for various reasons, including marketability, family food security and environmental sustainability. Although these choices often result in significant genetic erosion, the last two decades have shown that many farmers in the developing world, and increasingly in developed countries, continue to maintain significant crop diversity in their fields. Farmers appreciate diversity because it enables crops to adapt to marginal or heterogeneous environments. PGRFA have been recognized as critically important for the development of farming systems that are resilient to climate change and play a role in the control of greenhouse gases.

This priority activity aims to promote and improve the effectiveness of on-farm conservation, management

and use of farmers' varieties/landraces, crop wild relatives, underutilized crops, wild food plants and rangeland genetic resources, and their integration with *ex situ* conservation efforts. It also aims at realizing Farmers' Rights at national and regional levels and according to national legislation and priorities, including the equitable sharing of benefits arising from the use of PGRFA. The role played by women in on-farm management of PGRFA should be given due attention. This activity also envisions addressing the traditional seed exchange and supply systems at local community levels through strengthening of local markets, community gene banks as well as fostering the future emergence of public and private seed companies and cooperative enterprises.

3. Assisting farmers in disaster situations to restore crop systems

Natural disasters and civil strife often wreak havoc on agricultural systems. This particularly affects small-scale and subsistence farmers in developing countries. In the aftermath of disasters, it is often difficult for farmers to obtain locally adapted seed – even if it is available – because they lack the financial means. Grain imported as food aid is frequently used as seed even though it may not be adapted to local conditions. In the long run, inappropriate food and seed aid practices in post-disaster situations can intensify hunger, undermine local seed systems and increase the cost of donor assistance. In the past decade, a new thinking engendered by the need for a seed security framework has led to better coordination among agencies and new types of seed interventions, moving beyond direct distribution of seeds and other inputs to farmers. These include market-based approaches, such as seed vouchers and input trade fairs and community-based seed multiplication initiatives for both farmers' and improved varieties.

This priority activity aims to establish a seed security framework whereby governments develop and implement strategies for disaster responses that fully support the re-emergence of local seed supply systems. This activity will support efforts to collect farmers' varieties and crop wild relatives – particularly from areas that are vulnerable to disasters – and conserve them in national and international gene banks in case of need. Mechanisms should be established to identify, acquire, multiply and deliver high-quality locally adapted seed to stressed communities. Preventive community-based seed multiplication programmes should complement these mechanisms.

4. Promoting *in situ* conservation and management of crop wild relatives and wild food plants

Many national parks and protected areas harbour a wide range of wild food plants and crop wild relatives. Wild plants can be an important component of local diets – especially in poor growing seasons – and wild relatives of crop plants are an increasingly

critical resource for crop improvement. Yet little thought has been given to assessing the threats to wild plant genetic diversity in protected areas, let alone to conserving it *in situ*.

This priority activity aims to promote the sustainable use and conservation of crop wild relatives and wild food plants of importance to food and agriculture both within and outside protected areas. This will involve: measuring the threats to these plants; developing strategies and management plans to protect them *in situ*; promoting complementarity between conservation and sustainable use in parks and protected areas also by increasing the participation of indigenous and local communities; and creating a better understanding of the contributions of crop wild relatives and wild plants to local economies, food security and environmental health. Information on crop wild relatives and wild food plants and related threats should be collated and made widely available including through national information sharing mechanisms and specialized information systems. The activity also aims at establishing better communication between, and coordination among, the various bodies engaged in *in situ* conservation and land-use management at national and regional levels, especially between the agriculture and the environment sectors.

Ex situ conservation

National gene banks conserve about 6.6 million of the total of 7.4 million accessions held worldwide, a total that has increased by about 20 percent since 1996. While many gene banks provide adequate storage conditions for the materials they hold, others need to be further developed and strengthened. Coverage of crops in gene banks is also uneven, with much useful crop diversity found only in the wild or on farmers' fields.

5. Supporting targeted collecting of plant genetic resources for food and agriculture

Much of the genetic diversity of major crops – such as wheat and rice – is already held in gene bank collections; collections of most regional, minor and underutilized crops are far less complete. Crop wild relatives, even of major crops, have received scant attention relative to their potential importance in breeding. Less than optimal conditions in gene banks may also have caused the loss of collected materials. Meanwhile, changes in climate and land use and the replacement of traditional varieties with modern types are threatening PGRFA as never before.

The aim of this priority activity is to collect and conserve PGRFA and associated information, focusing on diversity that is missing from *ex situ* collections, under threat or expected to contain useful traits. Special attention should be given to crop wild relatives and minor and underutilized species. Collected material should be conserved in facilities with the capacity to manage them in the country of origin whenever possible and a duplicate sample deposited elsewhere for safety purposes, as agreed by the country of origin prior to the collecting mission.

6. Sustaining and expanding *ex situ* conservation of germplasm

While countries have expressed an interest in holding collections of underutilized crops, wild food species, forages and crop wild relatives, these species are generally more difficult to conserve in gene banks than are major food or forage crops. Even some globally important crop species – such as banana – do not produce seed that can be stored at low temperatures and low humidity; nor has there been much investment in the development of low cost technologies to conserve them. Many national programmes face major technical and administrative problems. Their gene bank facilities are deteriorating and they cannot perform basic conservation functions, regeneration being a particular gap.

This priority activity aims to ensure the development of a rational, efficient, goal-oriented and sustainable system of *ex situ* conservation and use for both seed and vegetatively propagated species. Sufficient capacity should be developed to provide options to countries for the voluntary storage of useful genetic materials and their duplicates. Conserved materials should be replicated and stored in long-term facilities

that meet international standards, in accordance with applicable international agreements. To reduce unnecessary redundancy of germplasm accessions in current programmes, holders of crop diversity – including national gene banks, breeders and non-governmental organizations – should coordinate and promote the exchange of information about PGRFA in line with national priorities and laws and relevant regional and international agreements, including the International Treaty.

7. Regenerating and multiplying *ex situ* accessions

Even under the best *ex situ* storage conditions, seeds eventually require regeneration to ensure their continued viability. While an accession may remain viable for many years – depending on the type of seed – low initial sample size or high demand by users can shorten the regeneration and multiplication cycle significantly. Research has found that regeneration backlogs exist for all crops and in all regions and that regeneration capacity has declined in several national gene banks. Inadequate documentation on accessions continues to be a constraint to a rational global approach to regeneration, although the necessary information is now increasingly available electronically.

The aim of this priority activity is to regenerate and multiply *ex situ* accessions in order to satisfy needs for conservation, distribution and safety duplication. Particular attention should be paid to regenerating material that is experiencing a loss of viability, that is globally unique and under threat in the field, and that is in, or intended for placement in, long-term storage. Whenever possible, regeneration partnerships, priorities and strategies should be established with inputs from crop and regional networks.

Sustainable use

Conserving crop resources without ensuring that they are used, amounts to nothing more than an archiving exercise. It is only by using crop diversity that countries can take advantage of its potential to foster economic development, reduce hunger and poverty and provide options for agriculture to cope with climate change.

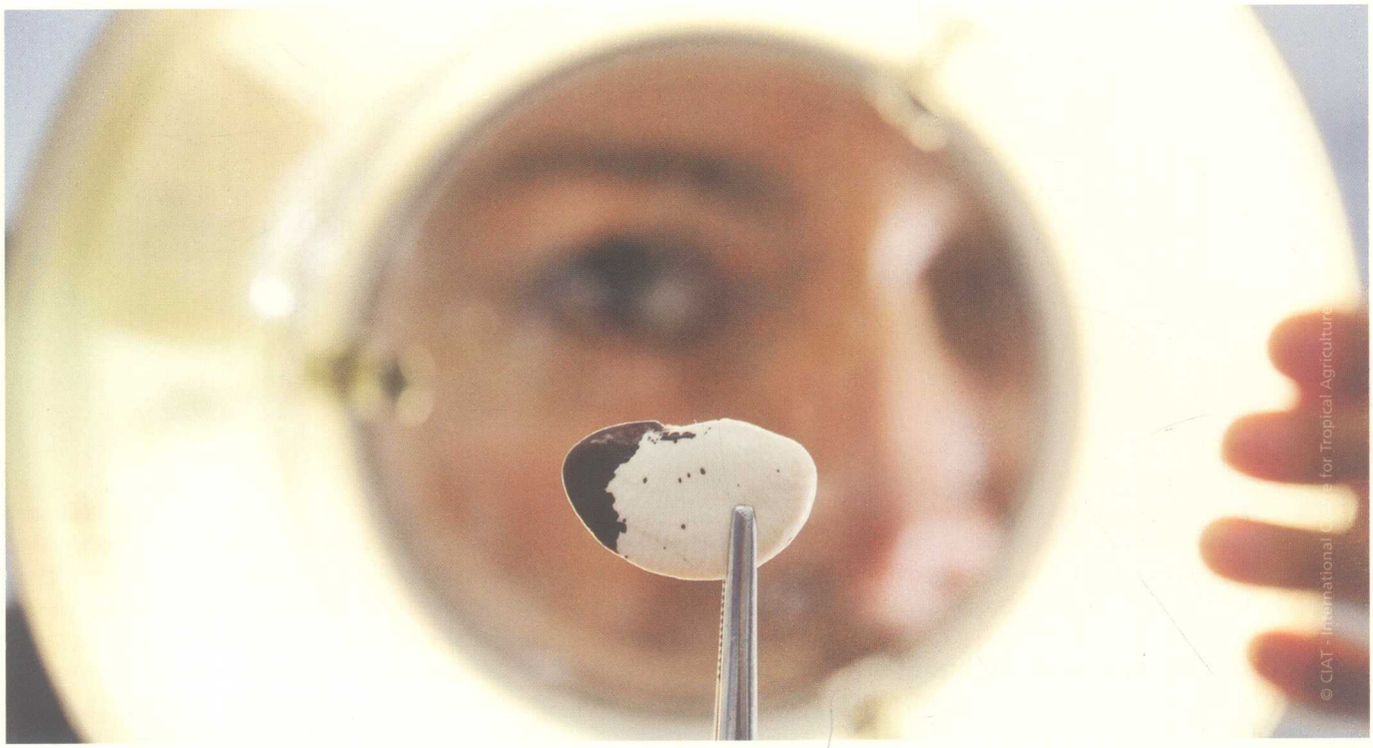
8. Expanding characterization, evaluation and further development of specific subsets of collections to facilitate use

In order for breeders and other users of PGRFA to make the most effective use of gene bank collections, they must be able to identify which accessions are likely to have the traits they need. The answer lies in the characterization and evaluation data that should accompany each accession. Characterization data record a plant variety's distinct and heritable defining features. Evaluation data record the traits that are promising for crop improvement. This information can also help gene bank managers to organize subset collections based on particular traits or that feature maximum diversity. These subsets have been shown to significantly improve the use of gene banks.

This priority activity aims to enhance the use and management of plant genetic resources held in gene banks, to fill data gaps and make it easier for users to access characterization and evaluation information so that these resources can be deployed directly in the field or used in research and crop improvement. It will be particularly important to assess gene bank accessions and breeding materials for traits associated with mitigation and adaptation to climate change. The goal is to make gene bank collections as useful as possible. This activity may involve developing and adapting molecular techniques, like high-throughput evaluation methods for gathering characterization and evaluation data, creating core and trait-specific collections, particularly for crops of global importance and improving the exchange of characterization and evaluation data.

9. Supporting plant breeding, genetic enhancement and base-broadening efforts

Plant breeding programmes are still often ill equipped to meet the demands placed upon them – particularly in light of climate change. There is a serious shortage of plant breeders in both the public and private sectors. Breeding programmes do not take enough advantage of the diversity available in gene banks nor do they often seek out the perspectives of farmers and other users when setting priorities. Besides, breeders make little use of techniques such as pre-breeding or genetic enhancement, which make collections more useable by furnishing breeding materials with traits to increase yields and resist pests and diseases and by increasing the amount of diversity available.



The aim of this priority activity is to support the development of resilient crop varieties that guarantee high yields under adverse environmental conditions and minimal input agricultural systems. This activity will promote pre-breeding and genetic enhancement, including by pooling the resources of gene banks and breeding programmes to ensure user access to the widest range of diversity possible. Breeders should pay greater attention to under-researched crops and should make greater use of crop wild relatives as a source of genes for adapting crops to climate change. Capacity building, policies promoting participatory plant breeding and financial support for the routine use of new breeding tools will be critical to the success of this activity.

10. Promoting diversification of crop production and broadening crop diversity for sustainable agriculture

Agricultural systems that depend too heavily on a limited number of crop varieties and species lack stability and resilience and are prone to yield losses due to pests and diseases. New challenges to agriculture point to the need to introduce more crop and species diversity into production systems to support agricultural sustainability. These include the need for long-term sustainability in agricultural practices, the challenges and opportunities posed by the production and use of biofuels, food and nutritional security and rural development, and climate change.

The aim of this priority activity is to promote sustainable agriculture by increasing diversity of crops and varieties on farm so as to reduce genetic vulnerability and boost productivity. Research is needed on domesticating wild species and using underutilized crops to develop crops and varieties that are more nutritious and are adapted to climatic change. It will be critical to involve local breeders and farmers in this activity to ensure that the varieties are adapted to local conditions and requirements. Governments should adopt adequate policies to support diversified production systems, including the use of multilines, mixtures and different integrated pest management strategies.

11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species

Today, commercial production systems pay little if no attention to the many traditional crops that are used