



GLOBAL PLAN OF ACTION

FOR THE CONSERVATION, SUSTAINABLE USE
AND DEVELOPMENT OF
FOREST GENETIC RESOURCES

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE



Foreword

Forest genetic resources (FGR) are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value. They are crucial to the adaptation and protection of our ecosystems, landscapes and production systems, yet are subject to increasing pressures and unsustainable use.

At its 11th session in June 2007, the Commission on Genetic Resources for Food and Agriculture emphasized the urgent need to conserve and sustainably use FGR, and included a report on *The State of the World's Forest Genetic Resources* in its Multi-Year Programme of Work.

On the basis of the information and knowledge compiled by FAO for *The State of World's Forest Genetic Resources*, the Commission developed the *Global Plan of Action for the Conservation, Sustainable Use and Development of Forest Genetic Resources*, adopted by the FAO Conference at its 38th session in June 2013. This *Global Plan of Action* identifies 27 strategic priorities grouped into 4 areas: 1) improving the availability of, and access to, information on FGR; 2) conservation of FGR (*in situ* and *ex situ*); 3) sustainable use, development and management of FGR; 4) policies, institutions and capacity-building.

Implementation of the *Global Plan of Action* will strengthen the sustainability of the management of FGR while contributing towards the Millennium Development Goals, the post-2015 agenda and the Aichi Biodiversity Targets. While primary responsibility for implementation lies with governments, FAO has a strong commitment to supporting countries in these efforts, working with governments and other partners at the national, regional and international levels and in line with FAO's Reviewed Strategic Framework approved by its Member States. Indeed, the *Global Plan of Action* is an integral part of FAO's efforts to realize its Strategic Objective 2, to "increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner".

I call upon all countries to seize the opportunities provided by this global framework to strengthen the conservation and sustainable management of FGR and unlock its potential for the benefit of present and future generations.



José Graziano da Silva
FAO Director-General

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Part I

INTRODUCTION

1. Forest covers about 31 percent of the world's total land area; 93 percent of this is natural forest and only 7 percent planted. Estimates of the number of tree species vary from 80 000 to 100 000. Forest ecosystems remain essential refuges for biodiversity, and 12 percent of the world's forest land is designated primarily for the conservation of biological diversity. Approximately 14 million people worldwide are formally employed in the forestry sector. Many more depend directly on forests and forest products for their food security and livelihoods. In developing countries, wood-based fuels are the dominant source of energy for more than 2 billion poor people. In Africa, over 90 percent of harvested wood is used for energy. Wood is not the only resource taken from forests. About 80 percent of people in developing countries use non-wood forest products to meet their nutrition and health needs and for income.

2. The contribution of forests and trees to meeting the present and future challenges of food security, poverty alleviation and sustainable development depends on the availability of rich diversity between and within tree species. Genetic diversity is needed in order to ensure that forest trees can survive, adapt and evolve under changing environmental conditions. It also maintains the vitality of forests and provides resilience to stresses such as pests and diseases. Furthermore, genetic diversity is needed for artificial selection, breeding and domestication programmes for the development of adapted varieties or to strengthen useful traits. In many countries, prospects for sustainable development

in rural areas will be greatly influenced by the state of diversity in forest ecosystems and species.

3. Efforts to sustainably manage forest genetic resources (FGR) at international as well as at national levels need to draw on solid and coherent baseline information. The country reports submitted during the preparation of *The State of the World's Forest Genetic Resources*, which were developed based on FAO guidelines, are the main source of comparable information on FGR and their management and have served as the basis for the identification of priority areas for action on FGR.

4. Conserving FGR is vital, as they are unique and irreplaceable resources for the future. FAO has for many decades acknowledged their importance. Already in 1967, the FAO Conference recognized that forest genetic diversity was increasingly being lost, and requested the establishment of the Panel of Experts on Forest Gene Resources (the Forest Gene Panel) to help plan and coordinate FAO's efforts in the management of the genetic resources of forest trees.

5. FAO's activities on FGR are an integral part of the FAO Forestry Programme and contribute to other programme components such as the Global Forest Resources Assessment, national forest programmes, sustainable forest management, tree breeding and plantation development, and protected area management. For many decades, the Forest Gene Panel has guided FAO's work on FGR, reporting on progress made to the Committee on Forestry (COFO).

Nature of the Global Plan of Action

6. The Global Plan of Action is voluntary and non-binding and should not be interpreted or implemented in contradiction with existing national legislation and international agreements where applicable.

7. The Global Plan of Action constitutes a rolling document that can be updated in line with any follow-up that the Commission on Genetic Resources for Food and Agriculture may decide upon.

8. The relative priority of each strategic priority and associated actions may differ significantly in different countries and regions. Relative priority may depend on the genetic resources themselves, the natural environment or production systems involved, current management capacities, financial resources or policies already underway for the management of FGR.

Rationale for the Global Plan of Action

Key features of forest genetic resources

9. Most forest tree species are wild, managed in natural ecosystems, or are at a very primitive stage of selection or domestication compared to agricultural crops.¹

10. Forest tree species are typically long-lived, highly heterozygous organisms that have developed natural mechanisms to maintain high levels of intraspecific variation, such as high rates of out-crossing, and dispersal of pollen and seeds over wide areas. These mechanisms, combined with native environments that are often variable in both time and space, have contributed to the evolution of forest tree species into some of the most genetically variable organisms on

earth.² *In situ* conservation allowing dynamic maintenance of genetic diversity and processes is the preferred approach for forest species, while *ex situ* conservation is most commonly used for domesticated plant species.

11. Forest species have multiple functions in that they provide numerous products and services. About 80 percent of people in the developing world use non-timber forest products for nutrition, health and income.

12. Quantifying the value of the benefit derived from FGR is difficult for several reasons. Apart from timber, most forest products are harvested for local consumption or commercialized without proper national monitoring and documentation. This is particularly the case in developing countries.

13. In terms of their present or potential contribution to food security and sustainable development, FGR are underutilized and undervalued.

14. Knowledge of FGR is usually scattered and held by various institutions in unpublished reports, meaning that in many countries access to it is limited. Baseline information, such as country species checklists, species distribution maps and forest reproductive material catalogues, are lacking.

15. The number of known forest tree species exceeds 80 000, but current efforts in Member countries to test and improve forest species focus on approximately 450 species.

Aims of the Global Plan of Action

16. The main aims of the Global Plan of Action are:

- to strengthen understanding and knowledge of FGR;

¹ National Academic Press. 1991. *Managing global genetic resources: forest trees*. Washington DC.

² FAO, FLD & IPGRI. 2004. *Forest genetic resources conservation and management. Vol 1: Overview, concepts and some systematic approaches*. Rome.

- to promote the sustainable use and management of FGR;
- to develop and strengthen *in situ* and *ex situ* FGR conservation programmes through collaboration at national, regional and global levels;
- to promote access to, and sharing of, information on FGR at regional and national levels;
- to create and strengthen national programmes to increase regional and international cooperation, including in research, education and training on the use and sustainable management of FGR, and to enhance institutional capacity;
- to assist countries, as appropriate, to integrate FGR conservation and management needs into wider national policies and programmes and frameworks of action at national, regional and global levels;
- to promote the assessment of FGR-related traditional knowledge, innovations and practices, the equitable sharing of benefits arising from their use, the recognition of their roles, and, where appropriate, the putting in place of effective policies and legislation addressing these matters;
- to promote adequate access to, and use of, quality forest reproductive material to support research and development programmes at national and regional levels and in line with the international laws and regulations regarding intellectual property;
- to promote ecosystem and ecoregional approaches as efficient means of promoting sustainable use and management of FGR;
- to assist countries and institutions responsible for the management of FGR to establish, implement and regularly review national priorities for the sustainable use and management of FGR; and
- to strengthen national programmes and enhance institutional capacity – in particular, in developing countries and countries with economies in transition – and

develop relevant regional and international programmes. Such programmes should include education, research and training to address the characterization, inventory, monitoring, conservation, development and sustainable use of FGR.

17. The strategic priorities of the Global Plan of Action are based on the assumption that countries have sovereign rights over their natural resources, including FGR, and that substantial international cooperation is necessary in the management of FGR. In this context, the strategic priorities of the Global Plan of Action were developed on the basis of the following principles:

- Genetic diversity is the mainstay of biological stability; it enables species to adapt to changing environments, including the effects of climate change and emerging diseases. It is the basis for present and future selection and breeding programmes. In addition to their irreplaceable contribution to environmental sustainability, FGR provide a direct food source for humans and animals, even at times when annual crops fail.
- Inventory, characterization and monitoring are necessary to generate the knowledge needed for proper understanding of trends in the status of FGR and to enable adequate decision-making in the sustainable management and use of FGR.
- *In situ* conservation is the most widespread conservation practice because most forest species grow wild and are not being domesticated. It also allows species populations to continue to be exposed to evolutionary processes.
- The effective management of FGR, at all levels, depends on the inclusion and willing participation of all relevant stakeholders. Appropriate participatory processes that ensure that the interests of different stakeholders are respected and balanced are required.

- Strengthening efforts to develop institutional partnerships within and among countries is essential, given that species distribution and ecosystem boundaries do not respect country borders. Strong partnerships and collaboration at various levels are needed in order to improve awareness and develop appropriate national and international regulations and policy tools that lead to sound technical and scientific programmes at national, regional and global levels.

18. Resource mobilization to allow timely and adequate implementation of the Global Plan of Action requires due attention and effort at all levels, including coordination with the numerous initiatives underway within countries, regionally and globally (Convention on Biological Diversity [CBD], Global Environment Facility, etc).

Structure and organization of the Global Plan of Action

19. The strategic priorities of the Global Plan of Action are often closely related and interlinked. Many of the actions foreseen are relevant to more than one priority. They are grouped into four priority areas:

1. Improving the availability of, and access to, information on FGR
2. Conservation of FGR (*in situ* and *ex situ*)
3. Sustainable use, development and management of FGR
4. Policies, institutions and capacity-building.



Part II

STRATEGIC PRIORITIES FOR ACTION

PRIORITY AREA 1

Improving the availability of, and access to, information on forest genetic resources

Introduction

It is recognized that reliable data on forest status and trends are of great importance to the efficient management of FGR. However, currently available forest-related information largely relates to forest resources in general rather than to forest diversity and variation in tree species. The availability of specific information on the status and trends in FGR is inadequate, although some progress has been made at national and subregional levels during the last decade.

The availability of, and access to, quality and up-to-date information on FGR is reported to be poor in many countries. Most country reports highlight the need to promote awareness among decision-makers and the general public of the importance of FGR and their roles in meeting present and future development needs. Lack of information limits the capacity of countries and the international community to integrate FGR management into cross-cutting policies.

Gaps in information related to FGR include the following:

- in many countries, a lack of an updated species checklist;
- a lack of an accurate global picture of the status and trends of FGR;
- a lack of a comprehensive assessment of national and international capacities to manage FGR;
- a lack of an accepted methodology for directly linking general information on changes in forests to their impacts on biological diversity, species, populations and genetic variation; and
- a lack of the knowledge of the reproductive and development characteristics of forests species that would allow for effective *ex situ* conservation, production of seedlings, planting and development of such species outside their original habitats.

These deficiencies complicate global monitoring of the status and trends of FGR and limit capacity for effective decision- making and action at national and international levels.

In many countries, there is an important relationship between the use and management of FGR and traditional knowledge. This valuable knowledge supports the livelihoods of indigenous and local communities in many developing countries, while also representing a tremendous asset for industrial and trade development in sectors such as pharmacy, food and biopesticides. Policies on FGR information management should take these important roles into consideration. Traditional knowledge is under threat as a consequence of FGR degradation and changes in land-use and sociocultural practices.

Long-term goal

Improve the availability and accessibility of knowledge and information on species and their genetic diversity, forest ecosystems and related traditional knowledge, to facilitate and enable decision-making on sustainable use and management of FGR and to enhance their contribution to solving serious global problems such as food shortage, land and water degradation, the effects of climate change, and increased demand for various forest products and services.

NATIONAL LEVEL

Strategic Priority 1

Establish and strengthen national FGR assessment, characterization and monitoring systems

Rationale: Information on FGR is inadequate in many countries. National forest inventories do not usually include the parameters needed for planning the sustainable management of FGR. Baseline information on the status, trends and characteristics of FGR is needed in order to allow the definition and regular review of priorities for sustainable use and conservation, as well as the development of tree domestication and improvement programmes.

Action: Promote species inventory and characterization. Promote mapping of the distribution of priority or important species populations. Reinforce the capacities of **national herbaria and botanic surveys** to support the development of knowledge on forest species.

Develop **technical standards, protocols and documentation systems** for assessing and monitoring the status of FGR management. Promote and support the development of **national and regional species checklists** and mechanisms for updating them regularly.

Develop **networks of forest genebanks, information units and databases**, and enhance information management and sharing at national and international levels.

Strategic Priority 2

Develop national and subnational systems for the assessment and management of traditional knowledge on FGR

Rationale: **Traditional knowledge** can make a significant contribution to sustainable development through practices such as local conservation and sustainable use of plants and can contribute to efforts to solve serious global problems such as climate change, desertification, and land and water degradation. There is therefore a need to preserve traditional knowledge of FGR by developing national assessments and improving documentation.

Action: Promote national-level assessments and documentation of traditional knowledge related to the use and management of FGR by local communities.

Develop national and subnational traditional knowledge registration mechanisms and databases to preserve, protect and promote traditional knowledge on FGR.

As appropriate, develop guidance on registering, accessing, storing and using traditional knowledge of FGR at national, subnational and local scales, with effective participation of indigenous and local communities, taking into consideration similar initiatives under the CBD.

INTERNATIONAL LEVEL

Strategic Priority 3

Develop international technical standards and protocols for FGR inventories, characterization and monitoring of trends and risks

Rationale: Scientifically sound, realistic and policy-relevant indicators for defining a baseline and monitoring the status and trends of FGR and their management are lacking at global, regional and national levels. There is a need to develop and use standardized methods and protocols for inventory, characterization and monitoring. There is also a need to enhance the coordination of research on the identification, mapping and characterization of species populations and to improve the impact of the results on FGR management policies.

Action: **Develop global criteria and indicators** for assessing the status and trends of FGR within national forest inventories and other forest-related programmes.

Develop protocols for participatory assessment and monitoring of FGR.

Strategic Priority 4

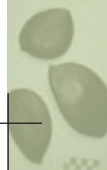
Promote the establishment and the reinforcement of FGR information systems (databases) to cover available scientific and traditional knowledge on uses, distribution, habitats, biology and genetic variation of species and species populations

Rationale: *The State of the World's Forest Genetic Resources* provides the first global overview of the diversity, status and trends of FGR and of national, regional and global capacity to manage these resources. Many country reports indicate that there are important gaps in knowledge of FGR and that information at country level is scattered and difficult to access. Furthermore, research programmes suffer from a lack of adequate financial support, especially in developing countries. There is therefore an urgent need to improve access to information on FGR for all stakeholders, while also developing the knowledge base required for sustainable use and management of FGR. There is also a need to improve countries' financial support to research activities.

Action: Improve access to information by developing and strengthening information management and sharing mechanisms at national and global levels.

Promote the establishment and maintenance of FGR databases at local, subnational, national, regional and global levels.

Improve access to information on forest species for a wide range of stakeholders, including indigenous and local communities.



PRIORITY AREA 2

In situ and *ex situ* conservation of forest genetic resources

The development of a worldwide conservation strategy for FGR is necessary in order to maintain the adaptive and neutral genetic diversity of forest trees and shrubs. This goal can be met by applying *in situ* conservation methods across the distribution ranges of tree species. Regional collaboration through species or thematic networks should play an important role in implementing the conservation strategy and monitoring the progress made. This collaboration should aim to facilitate the use of the ecosystem approach and to promote greater awareness of the different types of forest and tree management (Table 1) and the different levels of genetic conservation.

TABLE 1: THE MAIN TYPES OF FOREST AND TREE RESOURCES MANAGEMENT

Naturally regenerated forests			Planted forests			Trees outside forests, and agroforestry systems
Primary	Modified natural	Semi-natural	Plantations			
		Assisted natural regeneration	Planted component	Productive	Protective	
Forests of native species, where there are no clearly visible indications of human activities and the ecological processes are not directly disturbed by humans	Forests of naturally regenerated native species where there are clearly visible indications of significant human activities	Silvicultural practices in natural forest by intensive management: <ul style="list-style-type: none">• weeding• fertilizing• thinning• selective logging	Forests of native species, established through planting or seeding intensively managed	Forests of introduced and/or native species established through planting or seeding mainly for production of wood or non-wood goods	Forests of introduced and/or native species, established through planting or seeding mainly for provision of services	Stands smaller than 0.5 ha; tree cover in agricultural land (agroforestry systems, home gardens, orchards); trees in urban environments; and scattered along roads and in landscapes

Protected areas are established, regulated and managed to achieve conservation objectives in the context of growing pressure from the harvesting of forest resources and the conversion of forests to other land-use types. They mostly serve as refuges for species that are unable to survive in intensely managed landscapes. National programmes for the sustainable use and management of FGR should therefore take the important roles of protected areas into account, even though most of them may have been primarily designed for purposes such as the protection of wildlife (mostly animals), recreation and various ecosystem services.

Protected areas are suitable for the conservation of viable forest tree populations of diverse species and of representative ecosystem samples, as well as for maintaining vital ecosystem services.

Marginal and/or range-limits³ tree species populations may be crucial sources of adaptation to the novel environmental extremes that are expected to occur as a result of rapid climatic change. It is necessary to understand the dynamics of marginal forest species populations through adequate examination of adaptive genetic variation in quantitative traits. Furthermore, conservation in the context of climate change requires accurate estimates of the positions of future extreme environmental conditions (range limits). Modelling of species distribution dynamics needs to account for changes in species' distribution areas and in those of their associated environmental correlates (e.g. pollinators), and also for the possible influences of interactions with other plant or animal species.

Adequate *in situ* conservation measures are needed in order to preserve the natural growing conditions of tree species and thereby allow study and better understanding of their evolutionary processes and adaptation to changes. Information from *in situ* conservation activities for marginal and/or range-limits populations will be essential in providing options for adaptation to climate change.

On-farm management of FGR, including agroforestry systems, is identified as a land-use type that contributes substantially to *in situ* conservation of FGR, particularly domesticated or semi-domesticated species (e.g. the agroforestry parkland system in West Africa).

Many priority species identified in country reports from semi-arid zones are trees growing on farmlands, including agroforestry systems. Most of them are indigenous species that have been traditionally managed by farmers for centuries.

Tree diversity in farmland varies from a few species in some countries to more than 100 in some others. Some of these species are semi-domesticated species that occur only in agroforestry systems. Sustainable management of agroforestry systems is therefore needed in order to conserve the genetic resources of these species.

Given the large number of tree species recorded worldwide (see above), it is clear that there is a need for **priority setting** among the many species that might be targeted for action. Priority setting is complicated greatly by the lack of basic information on the variation, variation patterns and potentialities of many tree species.

The general aim of priority setting is to compare the consequences and trade-offs of a range of actions. It implies that some areas, species or genetic resources will be given lower priority than others. When different stakeholders have similar priorities, concerted action on the part of these stakeholders is possible. When their priorities are dissimilar, independent but harmonized action is more likely to succeed. It is likely that among governmental, non-governmental and international organizations active in forest biological diversity and genetic conservation, substantial differences will exist in terms of priorities, as well as in terms of their capabilities to implement various management techniques. Where such differences exist, it will be necessary to form coalitions for action, operating under coherent frameworks and at appropriate levels.

Commitment at national and local levels to specified objectives and priorities is a prerequisite for the implementation of sustainable conservation programmes. Governments have worked towards ensuring wide ownership of their country reports by organizing stakeholder workshops to review and validate them. During regional consultations in the Near East and North Africa, West Africa, Central Asia, Asia,

³ Sexton, P. et al. 2009. *Annu. Rev. Ecol. Syst.*, 40: 415–436.

the Pacific, Central Africa, East and Southern Africa and Latin America, regional priorities for action were identified. In many cases, regional priority species were discussed. However, the process needs to be continued in order to define detailed actions for each species and to allocate responsibilities among actors and partners at national, regional and international levels.

Ex situ conservation. In a growing number of situations, *in situ* conservation of FGR is no longer possible, in particular due to the effects of climate change. As a consequence, conservation strategies should include the creation of *in situ* and of *ex situ* conservation units.

Long-term goal

Maintain genetic diversity and the evolutionary processes of forest species by better implementing and harmonizing measures to conserve FGR, both *in situ* and *ex situ*, including through regional cooperation and networking.

NATIONAL LEVEL

Strategic Priority 5

Strengthen the contribution of primary forests and protected areas to *in situ* conservation of FGR

Rationale: In the current context of increasing pressure on forest land and forest resources, primary forests and protected areas remain refuges for threatened FGR. A substantial proportion of wild and/or endemic plants occur only in primary forests and protected forest areas. Only in those forests is the natural population genetic structure conserved. Natural processes involved in the dynamics of FGR resources are better assessed and understood in protected natural forests, which remain the best laboratories for studying species' ecology and biology. The contributions of primary forests and protected areas to the development of knowledge on plant species and to the conservation of FGR, therefore, need to be promoted.

Action: Develop collaboration between institutions or programmes in charge of protected forest areas and those responsible for the development and use of FGR, such as national forest tree breeding centres, forest tree seed centres and other forest germplasm collection and conservation institutions operating at national or regional levels.

Promote and reinforce the development of national FGR assessment and conservation activities in primary forests and **protected areas** and in **conservation forests**, with the participation of indigenous and local communities, as appropriate.

Manage genetic reserves within protected areas to maintain the evolutionary potentials of targeted species.

**Strategic
Priority
6**

Promote the establishment and development of efficient and sustainable *ex situ* conservation programmes, including *in vivo* collections and genebanks

Rationale: A comprehensive FGR conservation programme requires some combination of *in situ* and *ex situ* conservation. *Ex situ* conservation of FGR is mainly concerned with sampling as much as possible of the genetic variation that resides within and among populations of the target species.

Ex situ conservation is, in many cases, the only option available for conserving the intraspecific genetic variation present in peripheral or isolated populations⁴ that are seriously threatened by changes in land use and environmental conditions (drought, flooding, salinity, etc). The main objectives of an *ex situ* conservation programme for any particular species are:

- to serve as a backup measure should *in situ* conservation measures be unworkable or unavailable;
- to ensure that a wide range of the diversity available in the species is conserved; and
- to manage the regeneration of the species outside its original natural range (provenance) in a more controlled way, with specific objectives for conservation or use.

Action: Promote the documentation, characterization, regeneration and evaluation of FGR germplasm.

Collect seeds that are representative of natural variation.

Establish collections of improved seeds.

Promote the use of post-harvesting procedures that maintain the quality of the seed before and after *ex situ* conservation.

Promote and support the FGR conservation initiatives of indigenous and local communities.

Promote and develop mechanisms for the involvement of the private sector in the conservation of FGR.

Foster studies on seed collection, quality, conservation and reproduction.

Promote and encourage research on the conservation of recalcitrant-seed species.

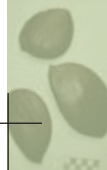
Promote the establishment of incentives for *ex situ* conservation.

**Strategic
Priority
7**

Support assessment, management and conservation of marginal and/or range-limits forest species populations

Rationale: Marginal populations are fragile and more inclined to degradation than central populations, because they normally have less variation. Evolutionary forces can have particular

⁴ FAO, FLD & IPGRI, 2004. *Forest genetic resources conservation and management. Vol. 3: In plantations and genebanks (ex situ)*. Rome.



effects on marginal populations and may lead to specific adaptations. Marginal populations should therefore have high priority in global and regional conservation strategies and programmes.

Action: Develop guidelines for the inventory and documentation of marginal forest species populations and promote their management and conservation through their integration into conservation networks and by emphasizing the participation of local communities.

Support programme development at global and regional levels to assess marginal populations and promote their conservation and evaluation in both *in situ* and *ex situ* conditions

Strategic Priority 8

Support and develop sustainable management and conservation of FGR on farmland

Rationale: Farmers contribute to FGR management and conservation on-farm in traditional land-use systems such as **agroforestry systems**. They therefore influence the **interspecific and intraspecific diversity of species in the landscape**. FGR managed in traditional agroforestry systems are seriously threatened by a lack of regeneration resulting from the increasing pressure on forest resources and current trends in agricultural intensification. There is a need to address the issue of on-farm management of FGR in countries where agroforestry is a common practice.

Action: Develop methodological tools for on-farm management and conservation of important agroforestry species.

Assess the status of conservation and management of important agroforestry species at national and regional levels.

Provide technical support to promote on-farm sustainable management and use of FGR.

Strategic priority 9

Support and strengthen the role of forests managed by indigenous and local communities in the sustainable management and conservation of FGR

Rationale: Forests managed by indigenous and local communities often have a stronger role in maintaining genetic resources than protected areas do. Forest management by indigenous and local communities has been shown to be one of the most effective means of combining conservation with poverty alleviation. There is a need for greater recognition and support for this role in countries where this type of management is relevant.

Action: Assess the status of conservation and management of FGR in forests managed by indigenous and local communities.

Provide technical support for the sustainable management and conservation of FGR in forests managed by indigenous and local communities.

Strategic Priority 10

Identify priority species for action

Rationale: Because of the complexity of the subject, FGR management is better handled using a species approach. Processes involved in genetic diversity dynamics determine species adaptation and performance in a given environment. Understanding and developing FGR using a species approach is regarded as a useful option. Given the high number of forest species present in each country, it is impossible to develop research activities or programmes for all forest species. Priority species should be identified at national and subnational levels, and these priorities should be shared in existing regional and international fora so as to provide better focus and more efficient resource use.

Action: Promote research networks focusing on important species at national, regional and international levels.

Update priority species lists regularly at both country and regional levels.

Provide international support for the development of guidelines for species prioritization and for the identification of priority areas of research.

The prioritization of species could focus on species, populations or varieties that have reduced populations and are in danger of extinction, or on species of diverse current and future value, including those of strategic, scientific and economic importance. The values of these species, populations, breeds or varieties could be linked to socioeconomic, gender, food security or climate change adaptation factors, or to sacred or cultural significance at local, national and international levels.

REGIONAL LEVEL

Strategic Priority 11

Develop and implement regional *in situ* conservation strategies and promote ecoregional networking and collaboration

Rationale: The ecosystem approach is a way to manage entire ecosystems in a holistic manner without excluding other management and conservation approaches such as area-based management tools and single-species conservation practices. Ideally, all these approaches should be integrated, through regional networks when appropriate.

Regional strategies for conservation of FGR, including regional networks of *in situ* genetic conservation units and corridors of priority species, are needed in order to ensure the dynamic conservation of key FGR and their evolutionary abilities for the future. Definition and implementation of regional conservation strategies provide a good justification for coordination and collaboration at regional level. Investment in joint activities at regional level may often be more efficient and cost-effective than the multiplication and duplication of activities at national level.

Action: Develop methodologies for the preparation of regional strategies for conservation of FGR, including principles for their implementation, taking into account existing experiences and using existing regional networks relevant to FGR.

Promote ecosystem-based partnerships and regional collaboration to develop species genetic resources conservation and evaluation programmes (*in situ* and *ex situ*) in line with commitments under existing international regulations

Mobilize resources by involving existing regional economic and environmental organizations.



PRIORITY AREA 3

Sustainable use, development and management of forest genetic resources

The challenge of achieving food security for all and environment sustainability in the context of the combined effects of climate change and increasing human pressure on forests is greater now than it has ever been. More efficient use and management of forest resources is therefore needed, especially in tropical and less-developed countries, in order to meet the growing demand for forest goods and services.

To ensure sustainable management of forests, the genetic resources of forest trees must be conserved and developed, whether they exist as trees in planted forest, natural forest or protected conservation stands, or as seeds or tissue cultures in storage. Managing FGR involves developing overall strategies, applying specific methodologies, developing and applying new technologies, and coordinating local, national, regional and global efforts.⁵

Monitoring forest biological diversity and managing FGR requires reliable information on the status and trends of these resources. There are no common standard methods for measuring changes in the status of FGR in relation to sustainable forest management as undertaken in most countries.

Parameters commonly included in national and global forest resources assessments, such as forest area, species occurrence and richness, and forest fragmentation, are not on their own sufficient to provide information on FGR. Adequate and commonly agreed indicators are needed and should be integrated into national forest assessment policies and monitoring tools.

Many countries face difficulties in obtaining the quantity and quality of forest reproductive material needed to implement their plantation programmes. Lack of an efficient tree seed supply system was reported as a bottleneck for national afforestation programmes by many countries. Furthermore, using improved forest reproductive material can be expected to provide a substantial production gain. Efforts should therefore be made to support the seed supply system.

Long-term goal

Enhance the sustainable use, development and management of FGR as a key contribution to environmental sustainability, food security and poverty alleviation.

⁵ National Academic Press. 1991. *Managing global genetic resources: forest trees*. Washington DC.

NATIONAL LEVEL

Strategic Priority 12

Develop and reinforce national seed programmes to ensure the availability of genetically appropriate tree seeds in the quantities and of the (certified) quality needed for national plantation programmes

Rationale: Countries reported that large plantations are being established to serve many purposes, including the production of timber biofuel and fibres, and the provision of various environmental services such as reclamation of degraded land and soil and water management. However, most developing countries lack adequate forest seed supply systems. This jeopardizes the success and performance of plantation programmes in these countries. This concern is highlighted in most countries' reports and was identified as a priority area for action by most regional consultations.

Action: Promote the establishment of, and support to, national tree seed supply systems.

Enhance **collaboration** between tree seed centres, and **develop common quality seed standards**, to facilitate the exchange of forest reproductive material within regions and support national afforestation programmes.

Strategic Priority 13

Promote restoration and rehabilitation of ecosystems using genetically appropriate material

Rationale: Millions of square kilometres of degraded and disturbed forest land are attracting attention from many national and international organizations and agencies as potential sites for restoration or rehabilitation, but little attention is typically paid to the importance of selecting appropriate genetic sources to produce planting material. The challenge of matching adapted populations to current and future environmental conditions is often complicated by the extent and the type of degradation and disturbance involved, which may require field testing and/or predictive modelling.

Action: Support and conduct research to identify key variables for choosing populations that are well-matched to current and future conditions at degraded sites.

Develop guidelines and decision-support tools for selecting appropriate genetic composition of planting materials.

Develop and implement monitoring protocols to assess the viability and resilience of tree populations over time at rehabilitated sites.

Strategic Priority 14

Support climate change adaptation and mitigation through proper management and use of FGR

Rationale: The current growing concern about climate change and its effects on ecosystems and the performance of forest-related production systems challenges stakeholders in FGR management to better understand forest species and mechanisms for adaptation to current and future climate changes. Genetic diversity is needed in order to ensure that species can adapt, as well as to allow for artificial selection and breeding to improve productivity. Thus, genetic diversity, including diversity among species, is the key to the resilience of forest ecosystems and the adaptation of forest species to climate change.

Action: Develop subnational, national and regional standard methods and guidelines for the identification, selection and use of species population conservation units, based on environmental and sociocultural factors, which are the main determinants of the status of forest and agroforestry ecosystem diversity.

Assist countries in their efforts to improve the conservation and sustainable use of FGR in the face of climate change by:

- promoting best practices in FGR management, specifically in the fields of conservation, exploration, testing, breeding and sustainable use; and
- promoting FGR's contributions to environmental sustainability through the development and use of well-suited genetic material.

Strategic Priority 15

Promote appropriate use of emerging technology to support the conservation, development and sustainable use of FGR

Rationale: Tree improvement activities remain limited to a few economically important tree species, not only because of financial constraints but also because of trees' specific characteristics. Trees are long-lived perennial species, with long regeneration cycles and late sexual maturity. Because of these characteristics, improvement and breeding research in tree species require more time than is required for the equivalent activities in other crops.

New technologies, as appropriate, such as genomics and micro-propagation, can help accelerate the selection process and unlock the huge potential of forest trees.

These new technologies have proved to be useful for understanding forest ecosystem dynamics, including genetic processes. They can orientate appropriate practical measures for sustainable conservation, management, restoration and rehabilitation.

Action: Promote the use of emerging technology to support the conservation and sustainable use of FGR, as well as tree improvement programmes, and to enhance the use of quality FGR in forestry programmes.

Assess available technologies and their effectiveness for use in *in situ* and *ex situ* conservation and in the development of the genetic resources of priority species.

Strategic Priority 16

Develop and reinforce research programmes on tree breeding, domestication and bioprospection in order to unlock the full potential of FGR

Rationale: In addition to timber, forests provide many other commodities that are important to local communities and to national economies. The importance of medicinal plants, fodder plants and food plants is increasingly recognized and strongly reflected in many country reports. In many developing countries, a large proportion of the population makes use of medicinal plants for health care. Free grazing is still a common practice in many developing countries, and forests are often an essential source of fodder. These various resources are still harvested from wild plants in forest lands and in some cases are under threat due to over-exploitation. Domestication of such plants will improve the supply of the targeted products while reducing the vulnerability of their genetic resources.

Action: Assess and evaluate the contributions of forest species to environmental services (soil and water conservation, carbon sequestration, etc.).

Assess and evaluate the contributions of priority forest species to important national production sectors (timber, fruits, fodder, vegetable oil, vegetables, medicines, etc.).

Develop programme-based multipurpose tree breeding for priority species. Promote participatory approaches by involving local communities in selection and breeding programmes for priority species, based on farmers' desired traits.

INTERNATIONAL LEVEL

Strategic Priority 17

Develop and promote networking and collaboration among concerned countries to combat invasive species (animals, plants and micro-organisms) as well as diseases and pests affecting FGR

Rationale: Invasive species are increasingly being noted as major threats to FGR. The major threats come from plant species that have the capacity to invade natural and/or slightly disturbed forest associations and become predominant, often displacing whole ecosystems and species. Pests and diseases affecting forests and trees are predicted to become an increasing threat as the effects of climate change become more prominent and the movement of plant material across countries and continents accelerates.

Action: Review existing standards and protocols, where appropriate, and, when needed, propose voluntary protocols for the movement of forest plant material across countries and regions, to avoid the spread of invasive organisms.

Promote national assessments of invasive alien species and their effects on FGR, using a regional or ecosystem approach.

Work with the International Plant Protection Convention to include FGR in existing biosecurity regulations and integrate concerns about FGR.

Promote the development of research on pests and diseases that affect FGR.



PRIORITY AREA 4

Policies, institutions and capacity-building

In many cases, national policies and regulatory frameworks for FGR are partial, ineffective or non-existent. FGR are not well understood or properly managed in many countries. Awareness building at all levels will be a key factor in mobilizing popular support and international collaboration for the implementation of the Global Plan of Action.

In many countries, there is an increasing demand for forest products, including round wood, firewood and non-wood forest products. Country data reported in the Global Forest Assessment 2010 showed that the value of non-wood forest products is sometimes higher than that of round wood and firewood. Sound social and economic policies are needed at national and global levels to ensure the integration of FGR into wider national forest policy frameworks and global initiatives such as the Global Forest Assessment and thereby promote the sustainable management of FGR.

In many countries, lack of trained personnel – both in terms of numbers and in terms of the skills needed to address FGR management in times of rapid social and economic change – is a major impediment to developing and implementing FGR policies, strategies, programmes and projects. Education and training to build sustainable capacity in all priority areas is required.

Institutional strengthening, training and support to research are needed in order to enable countries to respond to pressing and increasingly varied needs in FGR conservation and management. The measures required include the promotion of training and research – at national and international levels – on recent developments in FGR management. The role of national research systems and programmes, including tree seed centres, and their support by the CGIAR system, is crucial in this context.

In the context of scarce resources and a great risk of duplicating activities at national and regional levels, efforts should be made, when appropriate, to promote partnerships and coordination at national, regional and international levels. Promotion of networking should also be encouraged in order to improve links between stakeholders and to support institutional development and capacity-building.

Long-term goal

Establish and review relevant policies and legal frameworks in order to integrate major issues related to sustainable FGR management and to strengthen institutional and human capacity to achieve successful medium- and long-term planning of the forestry sector in member countries, as well as for the long-term sustainable use, management and conservation of FGR.

NATIONAL LEVEL

Strategic Priority 18

Develop national strategies for *in situ* and *ex situ* conservation of FGR and their sustainable use.

Rationale: Countries often lack adequate policies and programmes addressing *in situ* and *ex situ* conservation of FGR. Given the large number of stakeholders involved in many ways in the use, development and management of FGR at national level, it is useful to develop national strategies and programmes that provide an appropriate framework for action.

Action: Develop policy tools, where appropriate, to provide national frameworks for action for the sustainable *in situ* and *ex situ* conservation of FGR.

Develop or strengthen institutional capacities with respect to *in situ* and *ex situ* conservation of FGR to enable the implementation of existing or future national strategies for the conservation of FGR, including genebanks.

Strategic Priority 19

Update FGR conservation and management needs and integrate them into wider policies, programmes and frameworks of action at national, regional and global levels

Rationale: Many countries reported that due to the scarcity of financial and human resources, FGR will be best managed if relevant needs and priorities are taken care of by wider national forestry and land-use programmes and policies (e.g. national forest inventories and protected areas), in line with the Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets.

Action: Promote the review of national policy and legal frameworks on forests and the integration into them of key concerns related to FGR.

Review and align forest and land-use policies and programmes, where appropriate, to better integrate the FGR dimension and contribute to climate change mitigation and adaptation.

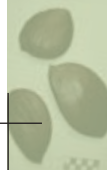
Amend national biosecurity regulations, where appropriate, to integrate concerns about FGR.

Strategic Priority 20

Develop collaboration and promote coordination of national institutions and programmes related to FGR

Rationale: There is a need to build synergy at national level between coordination units and national focal points of the various international programmes and conventions to enable efficient information sharing and resource use and to provide better support to efforts to address national priorities for FGR.

Action: Enhance cooperation and synergies between national authorities and national focal points in charge of FGR-related international programmes and conventions (e.g. CBD, United Nations Convention to Combat Desertification, climate change, access and benefit-sharing, Global Forest Resources Assessment, national forest programmes).



Create national consultation frameworks, such as permanent national commissions for FGR, to enhance sustainable management of FGR within national development and research programmes.

Strategic Priority 21

Establish and strengthen educational and research capacities on FGR to ensure adequate technical support to related development programmes

Rationale: Many countries reported that technical and scientific capacities on FGR are weak. University curricula on issues such as FGR conservation, tree breeding and management of non-timber forest products are rare in many countries. Research and education need to be strengthened in all areas of FGR management in most countries, in particular in developing countries and countries in economic transition. Establishing, strengthening and maintaining research and educational institutions is a key factor in the development of national capacities to plan and implement priority activities in the sustainable use, development and conservation of FGR.

Action: Develop appropriate training modules to support the management and use of the genetic resources of forest plants that are important sources of non-timber forest products.

Develop inter-sector and inter-institutional collaboration to make use of available scientific and technical information to ensure that the content of training modules is appropriate.

Organize training workshops on recent technological developments, as well as exposure visits for scientists and technicians and training courses for decision-makers and forest managers.

Strengthen national research and education programmes and capacity on FGR and promote regional connectivity and collaboration between institutions.

Reinforce the capacity and operation of national herbaria to support the development of knowledge on forest species.

Develop training modules or curricula that address FGR management. This could lead to: 1) the identification of medium- and long-term needs for qualified human resources to support national development and research activities on FGR; 2) the development of extension and education modules with special emphasis on modern technology (e.g. biotechnology), to support national education capacity on forestry and FGR management.

Strategic Priority 22

Promote the participation of indigenous and local communities in FGR management in the context of decentralization

Rationale: Many developing countries have a decentralized country administration or are undergoing a decentralization process. In such countries, natural resources management, including FGR management, should take this context into consideration. In some cases, regulation measures are decided at province or state level. In countries where this is the case, there is a need to provide appropriate technical support to decentralized administrations in order to enable them to review

or develop policy tools that ensure sustainable use and management of FGR, including protection, preservation and sustainable use of FGR for maintaining customary use by indigenous and local communities.

Action: Develop, strengthen or review local policies related to the management of forests, to increase awareness of FGR among local communities and to properly address the need for sustainable management, development and use of FGR at decentralized level.

Develop adequate human resources to support the proper management of FGR within ongoing decentralization processes and to enhance the contribution of FGR to local development.

REGIONAL LEVEL

Strategic Priority 23

Promote and apply mechanisms for germplasm exchange at regional level to support research and development activities, in agreement with international conventions

Rationale: Transfer and exchange of forest genetic material are regulated under international agreements, which, in some cases, can limit access to proper material and subsequently prevent research programmes from delivering results that are likely to have a real impact.

Action: Improve member countries' awareness and understanding of existing international regulations on genetic material exchange.

In compliance with national legislation and international regulations, improve or develop adapted national and regional exchange regulations that ensure that records are kept of the source and transfer of forest genetic material for research purposes, and promote mechanisms to facilitate access to material for scientific work within the region.

Strengthen and encourage regional networking on the exchange of forest genetic material.

Strategic Priority 24

Reinforce regional and international cooperation to support education, knowledge dissemination, research, and conservation and sustainable management of FGR

Rationale: One of the most common constraints to research activities on FGR is a lack of adequate financial and human resources. Member countries therefore recommend strengthening international and regional cooperation to better support education and research activities on the conservation and sustainable management of FGR.

Action: Promote the establishment or strengthening of networks that share information, experiences and theoretical and practical knowledge on FGR and their management.

Identify international channels for financial support (e.g. climate-related funds).

INTERNATIONAL LEVEL

Strategic Priority 25

Encourage the establishment of network activities and support the development and reinforcement of international networking and information sharing on FGR research, management and conservation

Rationale: Most regional consultation workshops identified networking as a priority for action that would improve information and experience sharing among stakeholders at global level.

Action: Establish better linkages and mechanisms to enhance coordination and collaboration between institutions on technology, policy implementation and information sharing.

Strategic Priority 26

Promote public and international awareness of the roles and values of FGR

Rationale: Many countries reported that decision-makers and the general public are not well aware of the importance of FGR. Needs and priorities for action at country, regional and international levels will be better supported by stakeholders if effective awareness-raising activities are developed and supported.

Action: Develop advocacy measures and tools to ensure effective communication and information sharing related to the sustainable management and use of FGR.

Support international campaigns to raise awareness of the status and trends of FGR and their contribution to the Millennium Development Goals, including contributions to food security, ecotourism potential, poverty alleviation and environment sustainability, and subsequently seek to develop wide support at government and institutional levels and among the general public.

Organize training on FGR for forestry technicians and administration managers.

Strategic Priority 27

Strengthen efforts to mobilize the necessary resources, including financing, for the conservation, sustainable use and development of FGR

Rationale: Most countries reported that the conservation, sustainable use and development of FGR lack adequate funding. Efforts need to be made at national and international levels to ensure that strategic priorities are successfully translated into actions within existing and/or new programmes.

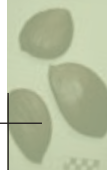
Action: Develop efforts to assist countries and stakeholders to design appropriate programmes and policies for the conservation, sustainable use and development of FGR and to secure adequate and sustainable funding, particularly in developing countries and countries with economies in transition.

Encourage countries and stakeholders to explore new funding opportunities, including climate change and biodiversity-related funds. Support the creation of sustainable incentives for conservation and sustainable use activities related to FGR.

PART II

SUMMARY TABLE OF THE STRATEGIC PRIORITIES OF THE GLOBAL PLAN OF ACTION FOR THE CONSERVATION, SUSTAINABLE USE AND DEVELOPMENT OF FOREST GENETIC RESOURCES

	Priority area 1: Improving the availability of, and access to, information on FGR	Priority area 2: <i>In situ</i> and <i>ex situ</i> conservation of FGR	Priority area 3: Sustainable use, development and management of FGR	Priority area 4: Policies, institutions and capacity-building
National level	SP 1. Establish and strengthen national FGR assessment, characterization and monitoring systems	SP 5. Strengthen the contribution of primary forests and protected areas to <i>in situ</i> conservation of FGR	SP 12. Develop and reinforce national seed programmes to ensure the availability of genetically appropriate tree seeds in the quantities and of the (certified) quality needed for national plantation programmes	SP 18. Develop national strategies for <i>in situ</i> and <i>ex situ</i> conservation of FGR and their sustainable use
	SP 2. Develop national and subnational systems for the assessment and management of traditional knowledge on FGR	SP 6. Promote the establishment and development of efficient and sustainable <i>ex situ</i> conservation systems, including <i>in vivo</i> collections and genebanks	SP 13. Promote restoration and rehabilitation of ecosystems using genetically appropriate material	SP 19. Update FGR conservation and management needs and integrate them into wider policies, programmes and frameworks of action at national, regional and global levels
		SP 7. Support assessment, management and conservation of marginal and/or range limits forest species populations	SP 14. Support climate change adaptation and mitigation through proper management and use of FGR	SP 20. Develop collaboration and promote coordination of national institutions and programmes related to FGR
		SP 8. Support and develop sustainable management and conservation of FGR on farmland	SP 15. Promote appropriate use of emerging technology to support the conservation, development and sustainable use of FGR	SP 21. Establish and strengthen educational and research capacities on FGR to ensure adequate technical support to related development programmes
		SP 9. Support and strengthen the role of forests managed by indigenous and local communities in the sustainable management and conservation of FGR	SP 16. Develop and reinforce research programmes on tree breeding, domestication and bioprospection in order to unlock the full potential of FGR	SP 22. Promote the participation of indigenous and local communities in FGR management in the context of decentralization
		SP 10. Identify priority species for action		
Regional level		SP 11. Develop and implement regional <i>in situ</i> conservation strategies and promote ecoregional networking and collaboration		SP 23. Promote and apply mechanisms for germplasm exchange at regional level to support research and development activities, in agreement with international conventions
				SP 24. Reinforce regional and international cooperation to support education, knowledge dissemination, research, and conservation and sustainable management of FGR



SUMMARY TABLE OF THE STRATEGIC PRIORITIES OF THE GLOBAL PLAN OF ACTION FOR THE CONSERVATION, SUSTAINABLE USE AND DEVELOPMENT OF FOREST GENETIC RESOURCES

	Priority area 1: Improving the availability of, and access to, information on FGR	Priority area 2: <i>In situ</i> and <i>ex situ</i> conservation of FGR	Priority area 3: Sustainable use, development and management of FGR	Priority area 4: Policies, institutions and capacity-building
International level	SP 3. Develop international technical standards and protocols for FGR inventories, characterization and monitoring of trends and risks		SP 17. Develop and promote networking and collaboration among concerned countries to combat invasive species (animals, plants and micro-organisms) affecting FGR.	SP 25. Encourage the establishment of network activities and support development and reinforcement of international networking and information sharing on FGR research, management and conservation
	SP 4. Promote the establishment and the reinforcement of FGR information systems (databases) to cover available scientific and traditional knowledge on uses, distribution, habitats, biology and genetic variation of species and species populations			SP 26. Promote public and international awareness of the roles and values of FGR
				SP 27. Strengthen efforts to mobilize the necessary resources, including financing, for the conservation, sustainable use and development of FGR



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