

Chapter 6. NEEDS, CHALLENGES AND REQUIRED RESPONSES FOR FUTURE

This final chapter summarizes the needs and challenges as well as responses needed in four priority areas for action identified in Country Reports and regional consultations in the preparation of The State of the World's Forest Genetic Resources: (i) improving the availability of, and access to, information on FGR, (ii) in situ and ex situ conservation of FGR, (iii) sustainable use, development and management of FGR and (iv) policies, institutions and capacity building.

6.1 IMPROVING THE AVAILABILITY OF, AND ACCESS TO, INFORMATION ON FGR

The need to have reliable data on the status and trends in forest genetic resources is essential and has become acute because of the increasing pressure on forest resources and the change in land use on the cost of forest. Quality data are required at country, regional and global levels to support decision making enable sustainable management of forest resources including genetic resources.

Global initiatives on forest information management such as Forest Resources Assessment (FRA) and national forest inventory and monitoring programmes have been developed to fill the gap. However, available forest-related information largely relates to forest resources in general rather than to forest diversity and variation within tree species. Availability of specific information on the status and trends in FGR is today inadequate, although some progress has been made at national and subregional levels during the last decade.

Availability of, and access to, quality and updated information on FGR is reported to be poor in many countries. Most country reports on the state of forest genetic resources 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.

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.

Information on FGR is inadequate or barely available in many countries. National forest inventories do not usually include the relevant concerns for the planning and sustainable management of FGR. In many countries the lack of updated forest species list and species distribution maps represents a serious constraint to the development of proper FGR management plans and activities. The capacity of many developing countries to conduct botanical inventories, manage national herbaria and genebanks are rather weak due to the limited number of plant taxonomists, forest geneticists and lack of adequate technical infrastructure. Objectives of forest inventories should include updating species list and developing of species distribution maps as this information is necessary for developing management plans for conservation, sustainable management and development of forest genetic resources.

Genetic resources is offer a unique opportunity for mankind to coop with important challenges such as the increasing demand in food, energy, wood products, and environment services etc. Baseline information on the status, trends and characteristics of FGR is needed in order to identify priorities for

actions to achieve sustainable use and conservation, as well as the development of tree domestication and improvement programmes.

In many countries, there is an important relationship between the use and management of FGR and traditional knowledge. The agroforestry farming system is a good example of such strong integrated socio cultural needs and farm land management practices. Traditional knowledge on the use of trees and tree products supports the livelihoods of indigenous and local communities in many countries, while representing a tremendous asset for industrial and trade development in sectors such as cosmetics, pharmacy, food technology, bio-pesticides etc. Furthermore it 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. However traditional knowledge is under threat as a consequence of FGR degradation and changes in land use and socio-cultural practices.

Policies on FGR information management should therefore consider traditional knowledge as an important source of information and an essential asset, which need to be adequately reflected in technical programmes and policy documents.

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. There is therefore an urgent need to improve access to information on FGR for all stakeholders by promoting the establishment and reinforcement of FGR information systems including databases to store and share available scientific information and traditional knowledge on uses, distribution, habitats, biology and genetic variation of species and species populations. The use of common protocols for FGR inventories, characterization and monitoring should be promoted to ensure that data collected from different countries are comparable.

Gaps in information and data needed to support adequate FGR management relate to:

- Availability of updated country species check list;
- Lack of a global picture of the status and trends of FGR;
- Comprehensive assessment of national and international capacities to manage FGR;
- Availability of appropriate indicators, which can be easily used to evaluate the status of forest genetic resources or to measure the impact of factors such as changes in environment or land uses, overexploitation and overharvesting on between and within species diversity.
- Knowledge on reproductive and development characteristics of forests species, allowing for ex situ conservation, effective production of seedlings, planting and development of such species outside their original habitats.
- Documentation of traditional knowledge and beliefs related to FGR use and management.

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 countries, while representing a tremendous asset for industrial and trade development in sectors such as cosmetics, pharmacy, food technology and bio-pesticides etc. Further more 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. Policies on FGR information management should therefore take these important roles into consideration. Traditional knowledge is under threat as a consequence of FGR degradation and changes in land use and socio-cultural practices.

Establish and strengthen national FGR assessment, characterization and monitoring system: Information on FGR is inadequate or barely available in many countries. National forest inventories do not usually include the relevant concerns for the planning and sustainable management of FGR. In many countries the lack of updated forest species list and species distribution maps represents a serious constraint to the development of proper FGR management plans and activities. The capacity of many developing countries to conduct botanical inventories, manage national herbaria and genebanks are rather weak due to the limited number of plant taxonomists, forest geneticists and lack of adequate technical infrastructure. Objectives of forest inventories should include updating species list and developing species distribution maps as these are information necessary for developing sustainable forest genetic resources management plans.

Genetic resources including forest is regarded by scientists and the international community as one of the major opportunity for mankind to coop with important challenges such as the increasing demand in food, energy, wood products, and environment services etc. Baseline information on the status, trends and characteristics of FGR is needed in order to identify priorities for actions to achieve sustainable use and conservation, as well as the development of tree domestication and improvement programmes.

Traditional knowledge related to use and management of forest resources should be regarded as an integral part of the resources and adequately reflected in technical programmes and policy documents.

Traditional farming and natural resources uses and management, including forest genetic resources are based on long established knowledge and practices that help to ensure food and agricultural diversity, valuable ecosystems, livelihoods and food security. However, traditional livelihoods and indigenous plant varieties, landraces are now increasingly endangered by large-scale commercialization of agriculture, population dynamics, land-use/cover changes and the impacts of climate change.

The importance of Traditional knowledge lies in its contribution to the welfare of indigenous and local populations in many developing countries. These facts are increasingly acknowledged in various reports and publications which highlight the use of forest and wild plants to meet the basic needs (food, medicine, shelter, etc.) of the rural communities. It contributes to sustainable development through

practices such as local conservation and sustainable use of plants. It can also contribute to solving 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.

- 5 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. There is therefore an urgent need to improve access to information on FGR for all stakeholders by promoting the establishment and reinforcement of FGR information systems including databases to store and share available scientific information and traditional knowledge on uses, distribution, habitats, biology and genetic variation of species and
10 species populations. The use of common protocols for FGR inventories, characterization and monitoring should be promoted to ensure that data collected from different countries are comparable.

6.2 IN SITU AND EX SITU CONSERVATION OF FGR

- The development of a worldwide conservation strategy for FGR is based on the need to maintain the adaptive and neutral genetic diversity of forest trees and shrubs. This goal can be met by applying in situ
15 conservation methods based on individual tree species distribution ranges.

- Regional collaboration through species or thematic networks should play an important role in implementing in situ conservation strategies for forest genetic resources and monitoring the progress made. This collaboration should aim at addressing the issue of in situ FGR conservation while taking into consideration the use of ecosystem approach as well as different forest and tree management types and
20 the different levels of genetic conservation.

- In situ conservation often comprises ecosystem functions and species interactions, rather than individual tree species. In addition forest have a number of native trees and shrubs that may be of minor interest to forest managers, but may be highly valuable in terms of genetic resources and future use. It is therefore important that the above described forest and trees management types includes specific
25 products and indicators related to sustainable forest genetic resources management in their regular monitoring protocols.

- In the current context of increasing pressure on forest land and forest resources, primary forests and protected areas remain refuges for threatened FGR. An important proportion of wild and/or endemic plants occur only in primary forests and protected forest areas. Genetic structure of species natural
30 populations is best conserved in those forests. 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.

Among the constraints identified by countries, the following should be highlighted:

- High levels of land clearing and deforestation with a variety of causes including poverty arising
35 from population growth and change in land use as a result of expansion of agriculture and an increasing market demand for timber and other wood products.

- Lack of or insufficient integration of FGR issues into current wider national policies and laws, impacting on FGR.
- Climate change reducing regeneration of conserved species; causing range shifts of species and vegetation communities due to shift in climatic zones.

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- Lack of knowledge on genetic diversity and processes, and gene-ecological zones,
 - Lack of knowledge of relevant policies, laws and regulations on the part of stakeholders, including those charged with law enforcement

10 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. They have a primary objective of ecosystems and biodiversity conservation and serve as a refuge for forest species which are unable to survive in intensely managed landscapes. The surface of protected areas has been increasing over the last decades as a result of national and international efforts to preserve biodiversity. This protection is implemented under many management types and categories including strict nature reserves, national parks, habitat/species management area, protected landscape, protected area with sustainable use of natural resources. National programmes for the sustainable use and management of FGR should therefore take the important roles of protected areas into account, although most of them may have been initially design for purposes such as wildlife protection, recreation and various ecosystem services.

20 Marginal and/or range limits tree species populations may be key in providing 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 current climate change context requires accurate estimates of the positions of future extreme environmental conditions (range limits). Modeling of species distribution dynamics needs to account for changes in species' distribution areas and in those of their associated environment correlates (e.g. pollinators) and also the possible influences of interactions with other plant or animal species.

30 Adequate in situ conservation measures are needed to preserve the natural growing conditions of the tree species in order to study and better understand their evolutionary process 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.

35 On-farm management of FGR, including agroforestry systems, is identified as one of the important land use types that contribute 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 (eg. *Acacia senegal*, *Vitellaria paradoxa*,). Sustainable management of the agroforestry systems is therefore needed in order to conserve the genetic resources of the species.

- 5 It appears from the country reports on the state of forest genetic resources that the number of species mentioned as country priority species varies from nearly 300 to less than 10. Given the high number of tree species recorded as priority worldwide as mentioned, about 2300 recorded from 86 country reports, it is clear that prioritization of the many alternative species should be encouraged for more efficient action at national regional or international levels. Priority setting is complicated greatly by the
 10 lack of basic information on the variation, variation patterns and potentialities of many tree species. Understanding and developing FGR using a species approach is regarded as adequate and useful option. Updated information on forest species of the country, their uses and level of threats are good bases for sound identification of country priority species for actions. Priority species can be identified at the national, sub-national levels and shared in existing regional and international fora so as to provide
 15 better focus and more efficient resource use.

- 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
 20 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.

- 25 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 a wide ownership of their Country Reports by organizing stakeholder workshops to review and validate the reports. During regional consultations in the Near East and North Africa, West Africa, Central Asia, Asia, the Pacific, Central Africa, East and Southern Africa and Latin America, regional priorities for action
 30 were identified. In many cases regional priority species were discussed. However, the process needs to be continued in order to define the detailed actions for each species and to allocate responsibilities among actors and partners at national, regional and international levels.

- Given the large number of stakeholders involved in many ways, in the use, development and management of FGR at national levels, it is useful that national strategies and programmes are
 35 developed to provide an appropriate framework of action.

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 forest genetic resources, including regional networks of in situ genetic conservation units and corridors of priority species are needed to ensure the dynamic conservation of key forest genetic resources and their evolutionary ability 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 regional level may often be more efficient and cost-effective than the multiplication and duplication of activities at national level.

Although in situ conservation is regarded as the most appropriate and cost effective way of conserving FGR, this can become difficult or impossible in some areas due to serious threats on species or species populations. Reasons for these threats are usually anthropogenic or climatic. Overexploitation, land use changes and climate change effects are increasingly causing loss of inter and intra species diversity. These negative trends were reported in many country reports and justifies that due attention is paid to ex situ conservation in conservation strategies at national, regional and global levels. Ex situ conservation may involve management of seed banks, gene banks or field collections. However countries are often lacking adequate policies and the necessary means to address the needs of adequate ex situ conservation of FGR. In some cases global or regional initiatives are needed for efficiency due to the high cost involved ex situ conservation programmes and activities.

Needs for to ensure adequate contribution of ex situ conservation to the overall FGR conservation include:

- Promoting good access to ex situ conservation data and information on FGR
- Improving and developing capacities for ex situ conservation at national, regional and/or global levels.
- Developing adequate technologies for the conservation of seeds, specially the recalcitrant once.
- Improving the scientific knowledge base on tree seed physiology and conservation technics.
- Promote capacity building on topics related ex situ conservation
- Promote new technologies, which can improve the efficiency and the economic accessibility to ex situ conservation technologies.

6.3 SUSTAINABLE USE, DEVELOPMENT AND MANAGEMENT OF FGR

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

Managing FGR involves developing overall strategies, applying specific methodologies, developing and applying new technologies, and coordinating local, national, regional and global efforts.

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 able to provide information on FGR. Adequate and commonly agreed indicators are needed and should be integrated into the national forest assessment policies and monitoring tools.

Countries reported that large plantations areas 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 many countries lack adequate forest seed supply systems and therefore face difficulties in getting the quantities and quality of forest reproductive material needed to implement their plantation programmes. This jeopardizes the success and performance of plantation programmes in these countries. Collaboration between tree seed centres should be enhanced, to encourage development and use of common quality seed standards, to facilitate forest reproductive material exchange within regions and support national afforestation programmes.

The current growing concern about climate change and its effects on ecosystems and on performance of forest-related production systems, challenges stakeholders in FGR management to better understand forest species 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. Countries should therefore develop adequate effort to Support climate change adaptation and mitigation through proper management and use of FGR.

Along with climate change, invasive alien species are increasingly being reported as major threats to FGR. These threats come from plant species, which have the capacity to invade natural and/or slightly disturbed forest associations and become predominant, often displacing whole ecosystems and species. Pest and diseases affecting forest 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.

Tree improvement activities remain limited to a few economically important tree species, not only because of the financial constraints but also because of the time necessary to obtain tangible results, due to the fact that 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, such as biotechnology, genomics and micro-propagation, can help accelerate the selection process and unlock the huge potential of forest trees species. The use of these new technologies has proved to be useful for understanding forest ecosystem dynamics and species genetic diversity and processes. They can provide options on practical measures for sustainable conservation, management, restoration and rehabilitation".

Adequate effort on domestication and bioprospection, by taking advantage of the large potential of FGR can substantially contribute to sustainable development through diversification in food and other economically valuable commodities. 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 and food plants is increasingly recognized and strongly reflected in many Country Reports. In many developing countries, a large portion of the population makes use of medicinal plants for their 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. Many countries particularly in the tropics underlined the need to develop domestication programmes with the objective to improve the supply of various forest products including non-wood forest products.

6.4 POLICES INSTITUTIONS AND CAPACITY BUILDING

In many cases, national policies and regulatory frameworks for FGR are partial, ineffective or inexistent given the fact that FGR is not commonly well understood and properly dealt with in many countries. The concerns on sustainable forest genetic management such as in situ conservation of species and species populations are usually lacking or inadequately addressed by most country forest policies. Awareness building at all levels will be a key prerequisite action towards mobilizing popular support and international collaboration to improve the conservation and management status of FGR. Appropriate advocacy tools need to be developed to ensure effective communication and information sharing related to sustainable FGR management and uses.

There is an increasing demand for forest products including round wood, fire wood and non wood forest products (NWFP) in many countries. Country data reported in the Global Forest Assessment 2010 showed that the value of NWFP is some times higher than round wood and firewood when information is available. Sound social and economic policies are needed at national and global levels to ensure integration of FGR in wider national forest policy frameworks and global initiative such as FRA for sustainable management of FGR.

Technical and scientific capacities on FGR were reported by many countries as weak. University training curricula on issues such as FGR conservation, tree breeding and management of NTFP are rarely available in those countries. Research and education need strengthening in all areas of management of FGR in most countries and particularly in developing countries and countries in economic transition. Establishing, strengthening and maintaining research and education institutions is key to building national capacities to plan and implement priority activities for sustainable use, development and conservation of FGR.

Transfer and exchange of Forest Reproductive Material are regulated under international agreements, which, in some cases, can limit access to proper quality material and subsequently prevent research programmes from delivering results that are likely to have a real impact. It is also regarded by

development actors as a constraint to accessing quality genetic material even for countries sharing the same ecological conditions. It was therefore recommended during most of the regional consultations workshops, to promote and apply mechanisms that will facilitate access to material for scientific work within regions as well as to encourage regional networking for exchange of FGR material, in compliance with national legislation and international regulations.

Institutional strengthening, training and support to research, are needed for countries to be able to respond to pressing and increasingly varied needs in conservation and FGR management. This includes promotion of training and research at national and international level in aspects related to recent development on Forest Genetic Resource Management. The role of National Research Systems and programmes including Tree Seed Centers and their support by relevant international programmes and initiatives are crucial in this context.

Many developing countries have a decentralized country administration or are undergoing decentralization process. Natural resources, including FGR, management should therefore be considered in this perspective for these countries. In some cases regulations measures are decided at province or state level. There is therefore a need to provide appropriate technical support to decentralized administrations in the countries to review or develop policy tools that ensure sustainable use and management of FGR, including protecting, preserving and sustainably using FGR for maintaining customary use by indigenous and local communities.

In the context of scarce resources and a great risk a duplicating the same activities at national or regional levels, efforts should be made to promote collaboration, partnership and coordination at national, regional and international levels when appropriate and to mobilize the funding required to ensure that the major needs and priorities on FGR identified by countries are adequately addressed by the stakeholders. Collaboration at national level should particularly aim at creating synergy between FGR related international programmes and conventions, coordinated by different national authorities, to enable efficient information sharing and resource use and for a better support of the national priorities identified on FGR. Furthermore most country reports and participants during the regional consultation highlighted the need to promote thematic networking to facilitate linkage between stakeholders, and enhance institutional development and capacity-building.

To particularly fill the gap in policy and institutional capacity related to the conservation, sustainable management and development of FGR as reported by many countries, the following needs should be addressed:

- Update and Integration of FGR conservation and management needs into wider national policies and programmes frameworks of action at national, regional and global levels
- Develop collaboration and promote coordination of national institutions and programmes related to FGR
- Establish and strengthen educational and research capacities on FGR to ensure adequate technical support to related development programmes

- Promote participation of indigenous and local communities in FGR management in the context of decentralization.
- Promote and apply mechanisms for forest reproductive material exchange at regional level to support research and development activities, in agreement with international conventions
- 5 • Reinforce regional and international cooperation to support education, knowledge dissemination, research, conservation and sustainable management of FGR
- Encourage the establishment of networks activities and support development and reinforcement of international networking and information sharing on FGR research, management and conservation
- 10 • Promote public and international awareness of the roles and values of FGR
- Strengthen efforts to mobilize the necessary resources, including financing for the conservation and sustainable use and development of FGR