Forest Genetic Resources Working Papers

Regional Updates

Prepared for

the Thirteenth Session of the FAO Panel of Experts on Forest Gene Resources, Rome, Italy, 10-12 November 2003

by


Members of the FAO Panel of Experts on Forest Gene Resources

2004
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The Forest Genetic Resources Working Papers report on issues and activities related to the conservation, sustainable use and management of forest genetic resources. The purpose of these papers is to provide early information on on-going programmes and activities, and to stimulate discussion.

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Quantitative information regarding the status of forest and tree resources, including genetic resources, has been compiled according to sources, methodologies and protocols identified and selected by the authors. Data comparison between countries and regions using different recording methodologies and sources may not be possible. For the latest findings and recommendations by the FAO Panel of Experts on Forest Gene Resources, please refer to the Report of the Thirteenth Session of the Panel, FAO, Rome, 2004. For standardized methodologies and data on forest resources, please refer to FAO, 2003. State of the World’s Forests 2003; and to FAO, 2001. Global Forest Resources Assessment 2000 (FRA2000). FAO Forestry Paper No 140. Official information, including the Report of the Thirteenth Session of the Panel, can also be found at the FAO Forestry Department Internet site (http://www.fao.org/forestry/Forestry.asp).

Comments and feedback are welcome.

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Introduction

The FAO Panel of Experts on Forest Gene Resources was established in 1968 at the request of the Fourteenth Session of the FAO Conference (1967). The 15 members of the Panel, appointed by the Director-General of FAO, in their own capacity, represent various regions of the world, and cover a broad range of technical and scientific areas in the field of forest genetic resources. The work of the Panel is supported by a network of national institutions which provide the Panel with information on activities and priorities on a continuing basis. The last meeting of the Panel took place in Rome, 10-12 November 2003 (13th Session).

The present Regional Updates provide updates on developments which have occurred in each region of the world since the 12th Gene Panel meeting (November 2001). They are based on each expert’s (Panel member’s) opinion and her/his contacts within the region covered. In order to collect up-to-date information on forest genetic diversity, Panel members have been in contact with other colleagues both in their own countries and in those countries covered by them.

To facilitate comparison between regions, information in the Regional Updates is presented according to a common outline. Each document including annexes has been kept voluntarily short. For more information, readers are invited to contact the individual authors (see Table 1 below).

The recommendations of the Panel are published in a separate Report in English, French and Spanish and are also available at the FAO website on Forest Genetic Resources: http://www.fao.org/forestry/FOR/FORM/FORGENRES/GENEPANE/general/FGRframe-e.stm
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1. REGIONAL UPDATE FOR USA/CANADA

by Y. A. El-Kassaby

Both Canada and the United States of America (U.S.A., excluding Hawaii) cover vast and diverse territories and include a wide range of forest types, e.g., subtropical, sub-alpine, temperate rainforest, boreal and temperate mixed-wood. The areas which can currently and potentially be utilized for forestry genetic resource applications thus encompass a huge array of land types and uses. Both of these highly developed, economically strong resource-rich countries have signed on to international commitments to sustainably manage and conserve genetic resources, and have adopted overall frameworks which resemble each other more often than not.

Major factors contributing to different forest genetic resource management strategies between the two countries are the system of land management and ownership, and population distribution across the land base. Canada features a primarily public system of land ownership where the provincial governments own, administer, regulate and assign tenure over resources, whereas in the U.S.A. most forest lands are a patchwork of private, state and federal jurisdiction and administration, the distribution of which varies between eastern and western forest types. It is estimated that 89% of harvested timber is extracted from private lands in the U.S.A., represented by over 10,000 landholders. Approximately 85% of Canada’s 30 million residents live in urban centres, nearly all of which are in the extreme southernmost portion of the country, adjacent to the Canada/U.S.A. border. The U.S.A. has ten times the population, of which 80% reside in metropolitan areas distributed throughout the continental landmass plus Alaska, engendering different land use priorities.

1. Policy and institutional issues

Canada
Canada has recently completed a State of the Forests report, as well as a National Forest Strategy, after extensive public and stakeholder consultation. The initiatives and priorities outlined in these policy frameworks is compatible with Canada’s international commitments to sustainable forest management and mitigation of factors affecting climate change via the United Nations, the Earth Summit, the Montreal Protocol, and the Kyoto Accord. Consumer pressure, both overseas and within Canada, has driven the forest industry towards forest certification. Certification is conferred by three independent agencies and one industry panel; genetic resource management is considered within the context of best forestry practices and provincial guidelines regarding provenance transfer.

The federal, provincial and territorial governments have been involved in hundreds of complex negotiations over the proprietary and management status of land on which Canada’s aboriginal peoples have lived for millennia. New treaties and agreements-in-principle are being negotiated and some provisions of historic existing treaties are being ameliorated to bring Canada’s aboriginal people to the forefront as equal partners in managing vast areas both in more developed and remote settings.

U. S. A.
The U.S.A. has also been committed to many of the same international agreements, including the Montreal Protocol and has developed an array of national strategies and policies to integrate forest resources planning across the patchwork of jurisdictions, towards the ultimate aim of sustainable forest management (SFM). The U.S.A. is not a signatory to the Convention on Biological Diversity or the Kyoto Accord. The framework National Forest Service Strategic Plan provides indicators for monitoring outcomes and ultimate certification, granted by several international and national agencies. Ancillary legislative articles include the Endangered Species Act, Northwest Forest Plan, and a host of others.

Forest genetic resources (FGR) stewardship is guided overall by a hierarchical group of policies, but measures are still ongoing to integrate the huge variety of landholders and administrative strata across the land-base, especially at larger scales. Primary landowners and managers include the Federal and
State governments, large and small private landholders including corporations and individuals, indigenous peoples, the Department of Defense, Bureau of Land Management, Parks Service, Forest Service (FS), U.S. Fish and Wildlife Service, Department of the Interior, Department of Indian Affairs, and a host of regional and state authorities. There are often inconsistencies in regulations and priorities at different hierarchical levels, and between adjacent administrative units.

2. Technical and biological issues

2.1 New FGR assessments, exploration, conservation programmes

Canada
Throughout Canada’s forested regions, there have been many protected areas established which provide in situ conservation of genetic resources. Information is available via the Conservation Data Centre (CDC), which works in conjunction with the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to prioritize and disseminate information on endangered, threatened or at-risk species, populations and ecosystems on red (critically imperiled) and blue (imminent threats to viability) lists. While not all species or provenances are represented in in- or ex-situ conservation scenarios at recommended effective population sizes (Yanchuk 2001), many species are and populations with unique adaptations such as pathogen and resistance mechanisms are actively sought out for breeding programs. The most sparsely populated areas, such as mountainous and remote terrain in the Rocky Mountains, features a high degree of protection, in the form of national and provincial parks and special management areas. FGR may be at risk are those which occur in localized areas only or those which grow primarily in the U.S.A. with the northernmost portion of the range occurring in Canada. Agencies such as the World Fund for Wildlife (WWF), The Nature Trust (TNT) and The Land Conservancy (TLC) are instrumental in raising the profile of such areas and forming partnerships to develop innovative means of securing identified critical habitats for conservation. Such species are typically under-protected and may be under pressure as a result of heavy southern land use or less long-term genetic stability due to limited ability to adapt to a severe or changing environment caused by founder effects at the advancing population front.

Populations which are not in genetic equilibrium are common in long-lived Canadian forest trees, which are still expanding their ranges northwards following the most recent glacial epoch.

Virtually all FGR management in Canada focuses around indigenous species, which is a consequence of the natural abundance of fibre adapted to the northern climate coupled with public preference. The British Columbia Ministry of Forests, in conjunction with the Centre for Forest Gene Conservation (CFGC) at the University of British Columbia (UBC), has been conducting in-depth gap analysis of priority forest genetic resource conservation. This is a follow-up to an assessment of conifer in situ gene conservation conducted in 1995 (Lester and Yanchuk 1995). UBC and CFGC have been assessing genetic diversity of populations of Acer macrophyllum, Arbutus menziesii, Cornus canadensis, Pinus albicaulis and other minor forest species with a variety of quantitative and molecular markers. Quercus garryana has been identified as a keystone species representing a unique and severely threatened ecosystem, and has been the focus of major conservation and collaboration initiatives, spearheaded by the Garry Oak Ecosystem Recovery Team. Other species, primarily Populus spp. and Picea sitchensis, have been investigated using a variety of molecular markers with respect to genetic and genomic diversity, applications as model species, host-pathogen systems and evolutionary and climate change applications. Markers such as cpDNA are being employed in B.C. Ministry of Forests seed orchards to evaluate pollen cloud mixing and confirm clonal identities; genetic screening for major gene resistance to blister rust in white pines is also operational.

Alberta has a comprehensive database including economically minor species which can be adapted to this use. Unique outlier populations of Picea glauca in Cypress Hills Provincial Park were identified as potentially having great value for climate change adaptation studies.
Saskatchewan has initiated collections of the following species for ex situ conservation: Prunus virginiana, P. nigra, P. americana, Crataegus rotundifolia, Quercus macrocarpa, Fraxinus pennsylvanica var. subintegerrima, Populus deltoides and several shrubs. Marker-assisted studies relevant to FGR in Alberta have recently focused on topics such as early selection for breeding, mating system evaluation, pathogen-host co-evolution, genomic mapping and expression, linkage and QTL analysis, and SE. A GIS-assisted gap analysis is being conducted in collaboration with public and private partners, including parks agencies, in order to develop a provincial forest genetic conservation strategy. Gap analysis has spurred collections from under-represented species including Abies lasiocarpa and Pinus flexilis as well as unique populations.

Other provinces rely on existing protected areas to capture sufficient in-situ genetic resources; most protected areas are established based on ecological biodiversity features, not specifically on genetic priorities. Some genecology experiments are furnishing data on economically important species including Pinus banksiana, Picea glauca and Picea mariana. Quantitative and marker-assisted studies are under way in most regions of the country to quantify levels of genetic diversity and local adaptation, especially with regard to the anticipated impact of climate change. These generally rely on partnerships with research facilities at academic institutions. Research at Dalhousie University, Halifax, NS, using molecular markers has also been conducted on Pinus strobus to determine the impact of historic forest harvesting and regeneration practices on the genetic resources of this species (Buchert et al. 1997; Rajora 1999; Rajora et al. 1998, 2000); the results have been used to amend Ontario’s silvicultural recommendations for this species. The Atlantic Forestry Centre of the Canadian Forest Service (CFS-AFC) has been identifying and prioritizing needs and impacts for Acadian FGR, such as a new focus on gene conservation for Picea rubens.

Research has highlighted Fagus grandifolia, Quercus grandifolia and Q. macrocarpa as candidates for activity based on past and anticipated changes, as well as current genetic status. Seed storage, pathogen susceptibility and resistance, new propagation techniques, genecology and anthropogenic effects have been identified as concerns; increased research and educational outreach to mitigate detrimental practices were recommended.

U. S. A.
There is substantial research in genecology and gap analysis for conservation and assessment of FGR in the U.S.A. The Forest Service (FS) and federal and state Parks Departments provide a national context and support system for regional and state activities, and collaborates with a wide variety of academic, local and cooperative groups. International agencies such as WWF and The Land Conservance (TLC), as well as a host of smaller regional and local groups are active in pursuing partnerships to include threatened or rare habitats for in-situ conservation. FGR research is being conducted with groundbreaking technology throughout the Southeast and Northwest, with research primarily driven by economically important species for fibre production as well as some introduced Eucalyptus spp. and Central American Pinus spp.

There have been extensive research and conservation programmes implemented in the Northwest and Southwest, such as University of California at Davis, where rare endemic populations of pathogenically threatened Pinus radiata have been the focus of a collaborative research and conservation program, including collection of baseline data, development of management and mitigation measures, and evolutionary genetic projects. The Pacific Southwest FS Research Station, in conjunction with UC Davis and other agencies, have also been involved in evolutionary phylogenetics of northwestern and southwestern Pinus species complexes, California Quercus spp., Chamaecyparis lawsoniana and other species. They have conducted mating system and genetic analyses of piñon pines, minor California conifers and southwestern Picea spp., in addition to biogeographic characterization and population impacts of climate change on many species. The UC Davis group has investigated adaptive variation in many widespread species such as Pinus lambertiana, P. coulteri and P. ponderosa common garden tests, and conducted extensive genetic modeling based on genotypic data of P. coulteri and fitness in P. torreyana. Other minor species projects include mutations in the ancient P. attenuata and P. coulteri × P. jeffreyi hybrids and backcrosses. The Mendocino National Forest houses a Genetic Resource and
Conservation Center, with ex-situ collections of Taxus spp., Pinus spp. and selections for disease resistance. Facilities such as this and other arboreta, often supported by the USDAFS or academic institutions, provide valuable ex-situ conservation of FGR and public outreach and education.

An assessment of Alaskan biodiversity protection (Duffy et al. 1999) determined that most trees were well represented (≥12%) within protected areas; other rare plants in forest ecosystems were under-represented. No specific genetic assessment was conducted, although baseline genetic data exists for Alaskan populations of several species as components of other studies (e.g., Picea sitchensis). The Pacific Northwest Forest Tree Gene Conservation Group is a partnership representing a wide membership, focusing on the genetic improvement and in-situ and ex-situ conservation FGR of eight commercial indigenous conifers, represented at natural range-wide elevations, phenotypic selections, populations and age class distributions. Emphasis on disease resistance screening and breeding in Pinus monticola and P. lambertiana, and on weevil resistance in Picea sitchensis was identified as important. Abies magnifica, Pinus monticola and Pinus ponderosa were identified via GIS-assisted gap analysis as candidates for further conservation activity. Germplasm collections from PNWFTGCG are conserved by the North American Plant Collections Consortium, which maintains a database.

The unique eastern hardwood forests featuring Quercus, Carya, Juglans and associated species have been the target for a more community-based approach. The Purdue University, IL-based Hardwood Tree Improvement and Regeneration Center (HTIRC), a partnership between USDAFS, state, private and academic interests, co-ordinate many activities such as: collecting baseline genetic and quantitative trait data, germplasm collection, storage and distribution, disseminating genetic resources management information to silviculturists and landowners, restore insufficiently regenerated or degraded lands, contribute to genetically sustainable hardwood forest management. Historical exploitation has led to concerns over the long-term viability and genetic quality of the resource, and mitigative measures have been initiated. Proppogules have been collected from many provenances and made available to individuals and agencies. Test plantings, also serving as genetic resource management areas, are providing new data regarding genetic, growth and yield and wood quality parameters. Juglans nigra is of special concern for conservation, wood quality and genetic gain, disease resistance and molecular mapping. This project is a collaborative one with Ontario-based groups such as the Oak Valley Nut Grove.

Pennsylvania state forest management policy specifically recommends the preservation of natural diversity levels, including genetic diversity, and has delineated transfer guidelines based on ecotypes and local adaptation.

2.2 Research on new forest products

The U.S.A. and Canada have developed an integrated development and market for these products, resulting in few differences between the countries with respect to research and development. An abundance of high-quality, easily accessible timber has enabled the forest industry to remain a critical economic driver in Canada, although market share has declined due to high costs. New paper and pulp technology, as well as research into rot-resistant and high-quality laminated wood, wood composite, high-end interior and exterior products has been developing rapidly across both Canada and the U.S.A., facilitated by cross-border holdings of international forest companies and driven by consumer demand for environmentally benign innovative products. Utilization of wood waste and composite products incorporating fiber and plastic for rot-resistant decking, and fibre and concrete for exterior siding have made significant inroads into the market. Structural insulation panels for prefabricated units, comprised of panels of styro-foam between plywood or oriented stand-board (OSB) sheeting are gaining in popularity. High-density laminating flooring is currently being developed in North America based on response to European introductions. Fibre quality has been eclipsed in favour of quantity as a result of the multitude of biotechnological “green” applications to pulp production, featuring a range of enzymatic and post-harvest treatments geared towards product uniformity and reduction in chemical processing. Many of these technologies utilize transformed bacteria or phages.
Interest in *Taxus* spp. as alternative forest product began in the last decade when the extractive taxol was tested for anti-cancer properties. Subsequent interest led to near-extirpation of many populations of this genus to fuel research demands, prior to successful laboratory synthesis. The Atlantic Forestry Centre of the Canadian Forest Service has an ongoing *T. canadensis* selection, breeding and propagation program, including tissue culture and somatic embryogenesis (SE) development focused on concentration optimization of the phytochemical taxane.

Western Canada and Pacific Northwest coastal and interior forests have long supplied international markets for lucrative forest mycorrhizal fungal fruiting bodies, such as the pine mushroom and chanterelle; cuttings and propagules of other species are subject to new pressure as residential and commercial gardening with indigenous plants has expanded. The B.C. Ministry of Forests and USFS have developed guidelines around non-fibre forestry products.

### 2.3 Activities in germplasm supply, demand, procurement and exchange

**Canada**

Arboreta and botanical gardens throughout Canada represent a substantial collection of *ex situ* germplasm. Under the auspices of CFS, the National Forest Genetic Resources Centre administers a centralized seed bank and online database with collections of many species, varieties, provenances and seedlots (http://ultratext.hil.unb.ca/Texts/Forest/MX203/english/title.htm). Research is ongoing into developing guidelines and best practices for germplasm storage and management. Facilities exist to procure and test seed according to international protocols. Provincial agencies also collect, store and provide seed, as do some private local firms. Conifer seed and pollen conservation and storage for long-term viability are being investigated in Quebec. Alberta maintains a genetic seed bank, which also tests material and maintains a database. *Picea glauca* pollen collection and viability testing have been initiated in Alberta. The University of B.C., in collaboration with the federally administered Pacific Forestry Centre CFS-PFC has been involved in a series of ongoing evaluations of the effects of seed storage and viability testing. UBC and the B.C. Ministry of Forests have also been evaluating the growth, form and physiological effects of vegetative and serial propagation on *Chamaecyparis nootkatensis*. The BC Tree Seed Centre maintains, processes, distributes and tests pollen, seed and clonal germplasm, as well as producing seedlings for reforestation; Ministry of Forests’ seed orchards have been evaluating the effects of various culture practices and environmental factors on pollen viability and seed production.

**U. S. A.**

The Champion Tree Project based in Michigan, with the support of many academic and government institutions, has been collecting, propagating and preserving germplasm of unique champion trees including several bristlecone pines, the oldest living extant plants on earth. As in Canada, the many arboreta and botanical gardens, often linked with academic institutions, provide archives of germplasm. Illinois-based HTIRC collects, maintains and distributes germplasm of eastern and mid-west hardwood species. Alaska has a facility dedicated to conservation of germplasm of high-latitude plant species, coordinated under the umbrella of the National Plant Germplasm System (NPGS), with 27 satellite facilities throughout the country.

### 2.4 Developments in tree selection and improvement, and field evaluation

**Canada**

Most provinces and Yukon have provenance trials for species of economic importance established according to provincial guidelines, where they exist (e.g., Alberta). Some installations are on more of an *ad hoc* basis.

The B.C. Ministry of Forests has many cooperative trials with the U.S. Pacific Northwest, which facilitates testing and transfer of materials along biogeoclimatic lines which cross administrative boundaries. In B.C., tree improvement cooperatives, industry, academia and provincial government partner to optimize the efficiency and ultimate value of operations.
Advanced generation progeny trials exist for _Tsuga heterophylla_, _Pseudotsuga menziesii_ var. _menziesii_, _Pinus contorta_ var. _latifolia_ and _Picea sitchensis_. Disease or pest resistance is the primary breeding objective for _Picea sitchensis_, _Pinus monticola_, and a minor objective for _Tsuga heterophylla_. Research into _Thuja plicata_ mating system reveals minimal volume compromise due to selfing; selection for wood durability based on biochemical analysis continues. Geneecology is a critical component of the _T. plicata_, _Chamaecyparis nootkatensis_ (comprised largely of clonal tests) and montane _Pseudotsuga menziesii_ and _Tsuga mertensiana_ genetic resource management programs. Breeding is ongoing for third generation _P. menziesii_ var. _menziesii_; elite crosses have anticipated gains of 17% over controls. Current research is being used to redefine seed transfer and breeding zones for _Picea glauca × englemannii_ and other species. Provenance tests have been established and monitored for a variety of other commercial conifers.

The Alberta Forest Genetics Framework comprises a policy framework to coordinate and standardize FGR management and data throughout the province. Partners include the provincial government and industry. Initiatives centre around indigenous important commercial species plus _Pinus sylvestris_ and _Larix_ spp. trials, as well as high-elevation _Picea engelmannii_. Breeding zones at the BC/Alberta border incorporate material from B.C. for testing. Orchards are still being established, and additional wild selections are being incorporated. Growth and wood quality are focal issues.

Manitoba Conservation – Forestry has partnered with major private forestry companies for tree improvement initiatives in _Pinus banksiana_, _Picea mariana_ and _P. glauca_. All activities, including orchard monitoring, establishment and maintenance are administered by a joint trust account. All tests are in their first generation, some sites have been rogued; weevil control remains a major objective. Gain estimates will be incorporated into provincial growth and yield projections. In a project initiated by CFS, twelve hybrid _Populus_ lines are being planted for testing in partnership with other provinces and test plantations are being established for _Picea glauca_. Saskatchewan has limited but successful first generation tree improvement programs for _Pinus banksiana_ and _Picea glauca_ administered by a private company and the provincial government. Agroforestry initiatives include several non-native species and various _Populus_ hybrids in clonal tests.

The Ontario Forest Research Institute conducted geneecological studies of _Pinus strobus_ and _Larix_ spp. based on phenological, growth and wood quality properties; screened many _P. strobus_ families for fungal resistance in an ongoing project; and propagated _Pinus banksiana_ vegetatively. Provenance trials provided data to improve seed transfer zones and model potential effects of climate change. First generation tree improvement programs resulted in 2-8% genetic gains, but were fraught with difficulty largely due to a lack of consistent quality control monitoring and implementation guidelines; advanced generation programs are being considered. _Juglans cinerea_ genetic resources quantification and testing has become a priority based on extirpation risk due to disease. A partnership between Natural Resources Canada and Shenyang, China has resulted in exchanges of seed for many species indigenous to both areas and associated gene conservation activities supervised by the Forest Gene Conservation Association. Seed data was assessed to determine optimal pollen, cone and seed management techniques for _Pinus resinosa_.

Tree breeding in Quebec is conducted under the auspices of the CFS and provincial government agencies, which are currently evaluating first-generation elite progeny trials of economically important indigenous conifers plus _Picea abies_. Selections are being made for second generation orchards, augmented by selections from first-generation open-pollinated provenance trials based on wood quality and growth. _Picea abies_ elite family gains represent 7-13%, despite susceptibility to weevil damage. _Picea glauca_ and _P. mariana_ seed transfer zones are being redefined. Wood quality attributes are being evaluated for improved _P. glauca_ material. _Picea_ spp. orchard management includes pollen contamination mitigation, such as supplemental mass pollination (SMP) and modifying wind flow patterns. Rogued first generation _Pinus banksiana_ orchards deliver gains of 1.9-7.2%; selected parent trees have been established in a second generation orchard, analyses of age-age correlations and density-dependent gains are being conducted.
Hybrid Larix spp., including L. decidua, L. laricina and L. kaempferi genetic material are being evaluated for boreal reforestation via vegetative propagation including SE, with decay resistance being a major objective. The hardwood species Quercus rubra, Acer saccharum, Betula alleghaniensis and Juglans cinerea have been established in provenance and progeny trials for wood quality and genetic variation assessment, as well as dedicated in-situ conservation plantations. Fraxinus americana trials are currently being established. Selections for hybrid Populus spp. for fibre production, wood quality and disease resistance have been made for long-term monitoring.

Progeny trials and selection regimes are largely administered by tree breeding cooperatives in partnership with private companies which are key forest landholders in eastern Canada: most are in the first generation, while some selections have been made for second generation trials. Nova Scotia and New Brunswick also have a breeding program for the northern European species Picea abies, currently undergoing selection for individuals with elite breeding values. Unrogued second-generation clonal seed orchards of Abies balsamea and Larix laricina and rogued second generation orchards exist for Pinus banksiana, Picea glauca and P. mariana; the latter have yet to meet seed production targets, but anticipated gains are 18-20%. Third cycle selections for Pinus banksiana continue; projected volume gains are 20%. Provincial governments play a small role in these provincial tree improvement programs.

Newfoundland has a limited tree improvement program, targeting Pinus strobus for disease resistance. Five indigenous species have been established in seed orchards from initial selections; controlled crosses are underway, with genetic gains for volume being the main objective.

U. S. A.

Tree improvement has a long history in the U.S.A. Southeastern tree breeding cooperatives have been involved in southern pine breeding for nearly 50 years. Outcome-driven partnerships between industry, government and academia have a very strong foundation in U.S. tree breeding. Several species of short-rotation pines account for most of the activity (Pinus taeda, P. palustris, P. virginiana, P. elliottii, P. clausa) and extensive plus-tree, provenance and progeny tests (open-pollinated, full-sib and polycross) representing thousands of families altogether are represented, several in advanced generations. Genetic gains in productivity and disease resistance have been substantial for advanced generation elite crosses; SE is operational for some species. Hybrids between southern pines and pines indigenous to Mexico and Central America are also being evaluated and deployed. Hybrid Populus spp. and Eucalyptus spp. are also in clonal trials for fibre production.

The Northwest has many provenance, progeny and breeding programs for economically important species, with most in advanced generations showing significant genetic gains for volume and wood quality. Idaho provenances of Pinus monticola resistant to fungal pathogens have been widely tested and bred by the Forest Service throughout the region, including collaborations with Canada, to restore the species across its natural range, from which it has been largely extirpated over the past century. The FS in Oregon also has a successful rust-resistance breeding and testing program for P. monticola and P. lambertiana, and has been collaborating with researchers on projects including screening for and evolutionary genetics of major gene resistance to Cronartium ribicola.

HTIRC in the mid-west focuses on indigenous hardwood species, primarily Juglans nigra. Selections, establishing breeding populations, and test plantings are currently underway. USDAFS, in conjunction with the University of Wisconsin at Madison, have a Pinus strobus tree improvement program with emphasis on disease resistance; seed orchards and test plantings represent genetic material from throughout the region; local provenances have proven inferior to Appalachian seed sources, although new installations are being established to verify this. P. resinosa disease resistance is also being investigated. The Wisconsin Department of Natural Resources has reported gains of up to 66% for their elite families in second-generation P. banksiana breeding cycle, in conjunction with selecting for rust resistance. They also conduct substantial evaluation and testing programs rust resistance in P. strobus, as well as assessments, progeny tests and seed orchard programs for P. rubens, Picea glauca, Quercus rubra and Juglans nigra, the latter two species in clonal orchards.
Pennsylvania has several breeding programs for attributes such as disease resistance in *Castanea dentata*, and *Fagus americana*; the main objective of *Quercus* spp. tree improvement is genetic gain. Other fast-growing pioneer species are being evaluated for site reclamation and remediation. The Northeast and Mid-west have been involved in Dutch elm disease mitigation but these primarily rely on integrated pest management (IPM) and less on tree improvement *per se*.

### 2.5 Threats to FGR, protection and conservation

**Canada**

The most pressing concerns to FGR include rapidly spreading and virulent pathogens of some pines and hardwoods, most of which have been fairly recently introduced into Canada. Some pest-resistant provenances of species such as *Picea sitchensis* have been previously identified but several of the original populations have been lost following land use changes. Habitat types which are underrepresented in protected areas and threatened with habitat loss or degradation are an issue in localized areas, such as the south-central Carolinian forest type of Ontario and Coastal Douglas-fir zone of BC. Both of these areas represent the northernmost extension of a larger region contiguous with the U.S.A. Anthropogenic climate change is expected to have a pronounced effect across Canada’s forested and adjacent non-forested regions within the next fifty years. Anticipated effects include: forest productivity changes, mal-adaptation of local genotypes in changed environments, and ecological niches of many species shifting north and upwards in elevation more rapidly than historical gene flow, and the landscape, can accommodate. Many studies across Canada are underway to assess, quantify and mitigate the genetic context of these factors at many scales.

**U. S. A.**

The patchwork of land ownership and management priorities appears to exacerbate delicate situations in FGR, but relationships among jurisdictions and landscape scales are being integrated with respect to priorities, planning and management with the ultimate goal of SFM. Population distribution and development also exerts pressure on species with limited distributions, and contributes to fragmentation. Many endemic species exist in varied habitats. Fire suppression has been shown to have detrimental effects on some species while favouring others in terms of successional and consequently genetic recruitment. Investigations into the genetic impacts of harvesting have addressed a growing number of forest types and species. Pathogens and insects, including introduced species and strains, continue to exert strong selection on some species and genotypes; and breeding programs are trying to mitigate these effects. Exotic species have been rapidly colonizing and outcompeting indigenous species in some areas; public education campaigns have been trying to address this issue. Climate change is anticipated to have less dramatic effects on U.S. FGR than in Canada, but modeling exercises are under way at many institutions and the U.S.A. has been an active participant in the International Panel on Climate Change (IPCC).

### 2.6 Advances in biotechnologies including genetic modification

**Canada**

All provinces in Canada have adopted a “No-GMO” policy for deployment on public forest lands; this is based on the widespread opinions of citizens with regards to their shared resource. Alberta states a proviso that this will be reconsidered as research becomes available. Private companies, academic institutions and some government agencies are developing and testing transformed organisms in controlled laboratory and nursery settings, focusing on disease resistance. Information on specific activities is often proprietary where patent protection is involved and not available to the public. The federal government is highly supportive of biotechnology and views Canada as being on the cutting edge.

B.C. has several private biotechnology and forestry companies developing and testing SE technology for several commercial species, as well as exotic species. *Picea glauca × engelmannii* SE candidates are being selected by the B.C. Ministry of Forests. Alberta has induced reproduction in potted *Picea* spp. with GA and heat; results were inferior to similar soil-based treatments.
CFS and Ontario provincial agencies have been involved in several DNA-based marker studies of coniferous species. Propagation techniques for *Pinus banksiana* are being investigated. A partnership between UBC, Genome BC and Treenomix as well as other collaborators are sequencing and developing markers and functional genomics applications for the *Populus* and *Picea* genomes, a large-scale project with many international and national collaborators exploring these genera as model organisms representing angiosperm and gymnosperm trees, respectively.

CFS-Laurentian Forestry Centre in Quebec has sequenced and constructed EST and genomic DNA libraries for several indigenous conifers and inferred phylogenetic relationships. *Populus* spp. molecular markers have been developed and used to gauge gene flow and introgression. Genetic effects of management practices have been quantified in *Picea mariana*. Non-timber species *Taxus canadensis* and *Juglans cinerea* have been evaluated for genetic diversity. *Picea glauca* seed transfer zones are being redefined based on quantitative trait analysis and potential for genetic adaptation to climate change. GA-mediated cone induction experiments are also underway for this species.

In partnership with Genome Canada and Laval, Minnesota and Carleton Universities and other allied institutions, model species poplar and spruce will be investigated for gene arrays responsible for wood quality and other traits. Follow-up activities include functional genomic projects such as identifying SNPs, expression-tagged transgenic material, evolutionary modeling and bioinformatics applications.

CFS-AFC has been conducting research on conifer reproductive biology, specifically: GA-mediated cone induction in *Picea mariana*, subsequent development of EST and SAGE libraries (4,000 from vegetative buds, 4,500 for cones), resulting in 40,000 SAGE tags (20,000 each for male and female buds) and ongoing sequencing. SE is operational for elite lines of *Pinus strobus*, *Picea glauca*, *P. mariana* and *P. abies*, followed up by RAPD genotyping and has also been successful in several non-commercial, non-native species. *Pinus banksiana* SE has been initiated but is currently unlikely to become operational. Genome Canada and Dalhousie University are partners in this venture. *Picea glauca* have been transformed by inserting the *Bt* gene, co-expressed with *Gus* and grown in a greenhouse trial evaluating mitigation of lepidopteran herbivory.

### U. S. A.

Many forest biotechnology companies exist in the U.S.A., and have been pursuing partnerships with private forestry firms to develop and test transformed materials, such as seedlings containing *Bt* genes for herbivore resistance, genes conferring sterility or delaying reproduction past rotation age, and/or genes to reduce lignin and increase cellulose production. Academic institutions also do substantial research in this field and have made many advances. Public opinion is not highly supportive of the technology; test deployments and laboratory facilities have been vandalized, and the nature and results of research and development in this field is largely proprietary. Developments in this area target disease and pest resistance, herbicide tolerance, rapid growth, and wood biochemical properties along agricultural crop production models. Transformed pine seedlings have been deployed in test plantations by private companies on private lands on a small but increasing scale.

The Institute for Plant Genomics and Biotechnology at Texas A&M University has developed an extensive tree genomics network, including EST and microarray development and sequencing, among a host of other applications. This information, coupled with development of molecular markers such as SNPs and microsatellites, has been employed in phylogenetic and evolutionary and functional genomics studies, and reconstructions of historical species distributions of southern pines. North Carolina State University is also involved in genomic research, which is aligned with their long established programs in quantitative genetics and tree improvement.

The University of Washington has a state of the art *Populus* genomics project, and has been producing ESTs, sequence data, microarrays, genomic map data and transformed seedlings. This project is a collaborative effort with other plant and tree genome initiatives and involves a variety of agencies.
Michigan Technical University has been involved in a program to produce *Populus* with high cellulose and low lignin content via transformation.

### 3. Operational and organizational issues

**New developments in training, education, extension, information management and dissemination**

Both Canada and the U.S.A have a good network of forest genetics courses and programs at educational institutions, with expertise and current technology in quantitative and molecular genetics as well as traditional breeding and population genetic applications. Many feature a mixture of laboratory, statistical, and field modules. Joint projects across jurisdictions are common and becoming more so, contributing to the body of knowledge and implementing projects including both countries. International researchers from a variety of other countries are also important contributors. Researchers and students are able to obtain advanced degrees at many facilities in Canada and the U.S.A. Certified foresters can also obtain upgrades in current FGR approaches to better implement SFM and protect biodiversity at all scales, as mandated by higher-level plans.

Electronic media is now a widespread source of information and extension, as well as providing a useful forum for discussion around any number of topics and providing remote assistance, such as statistical calculation and online access to regulations and guidelines. Electronic access to scientific research at institutions and by the general public provides a wealth of data and interpretation on many forest genetics resources issues. Sophisticated computer modeling is now commonplace with respect to climate change impacts, various management regime impacts on FGR, predicting evolutionary trajectories, etc.

Extension by tree improvement cooperatives and workshops involving local communities also help guide management and conservation activities. GIS is now a widely used tool which has been successfully integrated into FGR management and planning. Conferences, symposia and the like continue to provide valuable meeting grounds for sharing current research and ideas. Several academic journals dedicated or relevant to FGR have recently been established.

**Acknowledgments**

We thank the individuals and agencies who generously provided a wealth of information and direction for this report.

**References**

In addition to publicly available information online sources:


USA/Canada list of species identified as high, global, regional and/or national priority.  
Legend in Appendix 3

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### 1. REGIONAL UPDATE FOR USA/CANADA

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## 1. REGIONAL UPDATE FOR USA/CANADA

### Operations/ Activities

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<th>Exploration &amp; collection</th>
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**REMARKS**
- PVT, PGT, SO
- PVT, PGT, SO, breeding
- Cronartium quercuum sp. fusiforme resistance
- PVT, PGT, SO, (E)
- New Jersey, Delaware, Virginia, Alabama
- PVT, PGT, SO, (E), selection for Cronartium ribicola resistance
- PVT, PGT, CLT, SO
- PVT, PGT, CLT, MPTS
- PVT, CLT, MPTS
- PVT, SO, MPTS
- MPTS
- MPTS (E) Quebec, Nebraska
- PVT, MPTS (E) at periphery of range
- PVT, PGT, CLT, SO
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2. REGIONAL UPDATE FOR MEXICO

por F. Patiño Valera

1. Acciones institucionales y de política

1.1 Ley general de desarrollo forestal sustentable

El 25 de febrero 2003 se publicó en el Diario Oficial de la Federación la nueva Ley general de desarrollo forestal sustentable, que abroga la ley forestal de 1992 y sus posteriores reformas.

Es importante resaltar que esta nueva ley contempla varios aspectos ligados a los recursos genéticos forestales, regula tanto la colecta como el uso de los recursos genéticos forestales con fines de utilización en investigación y/o biotecnología; condicionando la autorización correspondiente, además de los requisitos técnicos incluidos en la Norma Oficial Mexicana correspondiente, al consentimiento escrito previo, del propietario o legítimo poseedor del predio en el que el recurso genético forestal se encuentre.

Reconoce y protege los derechos de las comunidades indígenas a la propiedad, conocimiento y uso de las variedades locales e indica que el registro y certificaciones de los recursos genéticos forestales o de formas modificadas de las mismas, así como las patentes obtenidas por personas físicas o morales, será jurídicamente nulos, sin el reconocimiento previo indicado, salvo lo acordado en los tratados y convenios internacionales relativos a la materia.

También contempla y norma la bioprospección en los recursos forestales y reconoce y apoya el conocimiento tradicional de los pueblos y comunidades indígenas, el fomento y el manejo sustentable de los árboles, arbustos y hierbas para la autosuficiencia y para el mercado, de los productos de especies útiles, incluyendo las medicinales, alimenticias, melfíferas, ornamentales, forrajes, fibras, aceites, colorantes, estimulantes, saborizantes, insecticidas, aromatizantes, artesanales, materiales de construcción, leña combustible, gomas y venenos.

Es importante resaltar que esta nueva ley contempla en sus artículos medidas para la conservación de la biodiversidad de los ecosistemas forestales y la conservación prioritaria de especies endémicas, en peligro de extinción o sujetas a protección especial. Legisla también en torno al uso de especies introducidas señalando que el uso de esas especies deberá ser compatible con las especies nativas y con la persistencia de los ecosistemas forestales.

Indica la importancia y fomenta la investigación, el desarrollo y la transferencia de tecnología para el manejo, uso y conservación del recurso forestal.

1.2 Centros públicos de investigación

En México, a partir del año 2000 y con base en la Ley de Ciencia y Tecnología, para acceder a los fondos públicos destinados a investigación científica, radicados en el Consejo Nacional de Ciencia y Tecnología (CONACYT) es requisito ser reconocido como Centro Público de Investigación, para lo cual existe un proceso que se inicia con la creación de una nueva figura jurídica, descentralizada de las formas tradicionales de administración pública, estatus que alcanzó INIFAP en 2001, en que por decreto Presidencial fue creado como Órgano Público Descentralizado con personalidad jurídica y patrimonio propios.

Continuando con la reestructuración de las instituciones de investigación del Gobierno Federal de los Estados Unidos Mexicanos, en 2003 se publicó en el Diario Oficial de la Federación la resolución por la que se reconoce al INIFAP como Centro Público de Investigación (CPI): para efectos de la Ley de Ciencia y Tecnología, la Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación y el Consejo Nacional de Ciencia y Tecnología, reconocen como Centro Público de Investigación al...
Organismo Público Descentralizado, denominado Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, INIFAP.

Este reconocimiento sumado al respectivo Convenio de Desempeño 2003-2005, conlleva los instrumentos y flexibilidades administrativas que permitirán al INIFAP, la posibilidad de mejorar su capacidad de responder a la demanda de generación de conocimientos e innovaciones tecnológicas que requieren los sectores forestal, agrícola y pecuario, en beneficio de la sociedad.

Un gran número de instituciones educativas han alcanzado también este estatus, entre ellas el Colegio de Posgraduados, que junto con el INIFAP, son las instituciones que mantienen en forma permanente un programa de investigación sobre recursos genéticos forestales.

2. Acciones técnicas y biológicas

México es un país con una gran biodiversidad debida principalmente a su topografía y a la gran variedad de climas que se presentan en su territorio. El hecho de que más de 50% del territorio nacional se encuentre en altitudes mayores a los mil metros sobre el nivel del mar, junto con las diferencias determinadas por la latitud, producen un mosaico climático con un número muy grande de variantes.

Por otro lado, la forma que le confieren al país sus litorales, junto con la alineación de sus principales serranías, influyen de manera decisiva en la distribución de la humedad y también muchas veces de la temperatura, a lo que hay que sumar la influencia de los océanos que bañan al país y que son determinantes en la presencia de humedad.

También debe destacarse que en México ocurren dos grandes regiones biogeográficas la neotropical y la neártica. Debido a esto, México constituye una zona biogeográficamente compuesta, donde el contacto entre biotas ancestrales ha dado como resultado una rica mezcla de fauna y flora con diferentes historias biogeográficas.

Sin embargo, existen algunos problemas que han limitado el uso y manejo de los recursos genéticos forestales y que deben resolverse a la brevedad, para salvaguardar el patrimonio genético de la biodiversidad forestal, para las futuras generaciones de mexicanos. Entre estas limitantes se pueden mencionar las siguientes:

- En México existe un conocimiento limitado sobre la magnitud, diversidad y estatus actual de los recursos genéticos forestales, así como del grado de deterioro, fragmentación y riesgo de sus poblaciones naturales;
- Las acciones para conocer, manejar, fomentar, mejorar y conservar los recursos forestales en general y la diversidad genética en particular son mínimas, con el consiguiente riesgo en un futuro inmediato de perder irremediablemente muchos genotipos valiosos;
- Los procesos de deforestación antropogénica, sumados a los fenómenos y meteoros naturales, están reduciendo drásticamente la superficie de la cubierta forestal de México, acentuando el peligro que se cierne sobre los recursos genéticos forestales;
- La producción forestal actual, no satisface la demanda interna de bienes y servicios derivados de los bosques, que requiere la sociedad mexicana actual y mucho menos la que requerirá su población futura.

Sin embargo existe en el país una preocupación creciente por la destrucción y fragmentación de los bosques y selvas, y se promueven en consecuencia, acciones que ayudan a la conservación del patrimonio natural, de la biodiversidad forestal y de los recursos genéticos contenidos en ellos, aunque debe señalarse que éstas acciones son insuficientes.
En el país existen instituciones de investigación y de enseñanza y organizaciones sociales, todas ellas ligadas en alguna forma al sector forestal, que cuentan con recursos humanos preparados, aún cuando no suficientes y con escaso apoyo económico, que pueden ser el motor para ejecutar el programa nacional y los componentes regionales para la gestión de los recursos genéticos forestales.

Por otro lado, se tiene vinculación con organismos internacionales como la FAO, IPGRI, ICRAF, CIFOR, IUFRO, con agencias de desarrollo como DANIDA a través de su Centro de Semillas Forestales (DFSC), el Servicio Forestal de Estados Unidos, con organizaciones regionales como el CATIE y Universidades de varios países del mundo que cuentan con recursos humanos preparados y recursos que pueden asociarse a la iniciativa nacional sobre los recursos genéticos forestales.

En tal virtud, se iniciaron en México dos procesos importantes para los Recursos Genéticos Forestales:

- la realización de talleres de trabajo para elaborar la estrategia nacional para el manejo y uso de los recursos genéticos forestales en un nivel operativo y en el que intervienen todas las instituciones que realizan actividades en torno a estos recursos en el país, organizados por la Comisión Nacional Forestal, y
- El fortalecimiento del Programa Nacional de Investigación sobre Recursos Genéticos Forestales del INIFAP.

2.1 Programa nacional para el manejo de los recursos genéticos forestales

La Comisión Nacional Forestal (CONAFOR), convocó a las instituciones nacionales de investigación, Universidades y organizaciones de productores forestales, a un Taller para analizar el estado de los recursos genéticos forestales en México y concertar acciones que conduzcan a la creación de un Programa Nacional de manejo de los recursos genéticos forestales, de tal manera que se permita integrar los esfuerzos, ahora aislados, que realizan las instituciones nacionales para optimizar el manejo, uso y conservación de éstos importantes recursos.

Los temas guías de la propuesta, están orientados en cinco grandes vertientes:

- Conservación de recursos genéticos forestales
- Mejoramiento genético para plantaciones
- Necesidades y prioridades de investigación en RGF
- Investigación y Fortalecimiento Institucional
- Restauración de ecosistemas forestales

2.2 Programa nacional de investigación de los recursos genéticos forestales

El Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP) desarrolla desde hace décadas un Programa Nacional de Investigación sobre Recursos Genéticos Forestales, el que está acorde y forma parte del Plan Nacional de manejo de los recursos genéticos forestales, que a nivel operativo desarrolla la CONAFOR y busca generar conocimientos y tecnologías que apoyen al Programa Nacional Operativo, antes señalado.

El programa nacional de investigación contempla el enfoque de la biodiversidad con especial énfasis a los ecosistemas forestales, en la búsqueda de alternativas para su conocimiento, manejo uso y conservación; entre sus objetivos se pueden destacar los siguientes:

- Asegurar la conservación de los recursos genéticos forestales de alta prioridad nacional y en cada región ecológica, como un pilar básico del manejo sostenible de los recursos forestales y del mantenimiento de la diversidad biológica.
Promover la utilización sostenible de los recursos genéticos forestales de tal manera que se fortalezca el desarrollo nacional y regional y se contribuya en cierta medida a la disminución de la pobreza.

Sentar las bases para promover la equidad en la distribución de los beneficios obtenidos por la utilización de los recursos genéticos forestales, reconociendo que es igualmente deseable la difusión de conocimientos y tecnologías innovativas así como también de las prácticas tradicionales que ayuden y faciliten la conservación y uso sostenible de los recursos genéticos.

Proporcionar argumentos y herramientas para desarrollar, fortalecer y armonizar las políticas y medidas de regulación y de legislación nacionales, de acuerdo con las circunstancias, y promover la inclusión de los recursos genéticos forestales en los esquemas de manejo tanto nacional como regional.

Presentar documentos que orienten a los tomadores de decisiones y a los profesionales y productores del ramo, para fortalecer y promover los programas nacionales para el manejo, fomento y uso de los recursos genéticos.

Proporcionar información básica que permita visualizar la necesidad de apoyar el fortalecimiento de la capacidad institucional de las instancias encargadas de la investigación y de la operación de los programas relacionados con los recursos genéticos forestales y de desarrollo forestal.

Prestar particular atención a la planeación y ejecución de estrategias nacionales encaminadas hacia la conservación y uso de la biodiversidad, del fomento forestal, así como al aumento de esfuerzos destinados al mejoramiento genético de las especies prioritarias para la obtención de mejores semillas para uso de los programas nacionales.

2.3 Talleres regionales sobre los recursos genéticos forestales

A invitación de la FAO, México participó en el Taller sobre los Recursos Genéticos para Centroamérica, Cuba y México, con la participación de profesionales tanto para la preparación de documentos

Considerando que México contiene recursos genéticos forestales de clima templado frío, de zonas áridas y semiáridas y de clima tropical, se invitó a participar a dos especialistas: Dr. Jesús Vargas H. y Dr. José A. Gil Vera Castillo, para preparar los documentos nacionales correspondientes, uno a la parte norte y centro del país y el segundo para la parte sur sureste, incluyendo los ecosistemas forestales de coníferas y latifoliadas de clima templado frío y los de vegetación tropical.

Lo anterior permitió dar compatibilidad a la presencia de especies comunes entre Centroamérica, Cuba y México y de esa manera realizar la priorización de especies comunes.

Durante el taller, se presentó la situación de los recursos genéticos forestales en México información sobre áreas protegidas existentes, amenazas a los recursos genéticos y sobre las políticas forestales vigentes, relacionadas con la gestión de los recursos forestales.

Se informó sobre el avance logrado en el mejoramiento genético y la conservación, con especial énfasis en el germoplasma forestal de las especies más utilizadas en plantaciones.

Los documentos nacionales incluyen listas de especies, tanto nativas como introducidas consideradas como prioritarias, en las que se indican las especies con importancia socioeconómica actual y potencial. Esta lista tiene una relación directa con las especies que están siendo más utilizadas en los esfuerzos nacionales de plantación y con aquellas que han sido trabajadas para su conservación y mejoramiento.
Considerando la importancia de utilizar al máximo las capacidades institucionales que operan en la región, se invitó a participar en el taller a representantes de instituciones nacionales de investigación y educación superior, por parte de México participaron el Dr. Hugo Ramírez Maldonado, Director General de Investigación Forestal del INIFAP y el Dr. Jesús Vargas H. Investigador del Colegio de Pos graduados de México. Se abordaron las oportunidades existentes para la coordinación de la investigación, la educación formal y la capacitación a nivel de la región.

Los documentos generados por los especialistas de México, que han sido difundidos por la FAO como documentos de trabajo, se citan a continuación:


El suscrito participó a invitación de la FAO como consultor para apoyar la organización del Taller con sede en Roma, Italia y para preparar un documento de trabajo que sirviera de guía a los autores de la región para preparar sus correspondientes documentos, que también ha sido difundido por la FAO como documento de trabajo, mismo que se cita a continuación:


2.4 Comisión forestal para América del Norte


La Comisión recomendó que el Grupo de Trabajo examinara los vínculos con otras organizaciones que se ocupaban de los recursos genéticos, como la Comisión de zonas naturales protegidas de México. La Comisión recomendó también que el Grupo de Trabajo tuviera en cuenta las actividades pertinentes previstas en el programa de trabajo sobre la diversidad biológica de los bosques del Convenio sobre la Diversidad Biológica.

El Grupo de Trabajo sobre Silvicultura, que se había centrado tradicionalmente en la silvicultura tropical, había participado en una reunión conjunta con el Grupo de Trabajo sobre Recursos Genéticos Forestales y en el 16º Taller sobre Biología Forestal. Se había preparado un Manual sobre semillas de árboles tropicales y se habían incorporado al Grupo varios miembros nuevos.

La Comisión encargó a la Mesa de Suplentes que examinara las prioridades del Grupo de Trabajo sobre Silvicultura, en especial para examinar la posibilidad de ampliar su alcance a fin de incluir los bosques de zonas templadas y de examinar las opciones para ocuparse de las plantaciones forestales, teniendo debidamente en cuenta el documento técnico sobre las Plantaciones forestales en América del Norte.

La FAO informó a la Comisión acerca de los coordinadores designados en el Departamento de Montes para servir de enlace con cada Grupo de Trabajo y alertó a los grupos de trabajo a que establecieran contacto con los coordinadores de la FAO y emprendieran actividades conjuntas con la Organización.
México presentó el documento *Plantaciones forestales en América del Norte*. Era la primera vez que se trataba dicha cuestión en un contexto de colaboración entre los tres países de la región. La importancia de las plantaciones forestales estaba aumentando en América del Norte al igual que en el resto del mundo. La proporción de productos forestales mundiales procedentes de los bosques plantados estaba aumentando rápidamente. Los autores indicaban que existían oportunidades para estudiar más a fondo la contribución de las plantaciones a la diversificación de los ingresos, al suministro maderero futuro y a la retención de carbono, y para intercambiar información al respecto. Asimismo identificaban como esfera de interés común para los tres países la colaboración en investigaciones sobre la gestión de los nutrientes y el agua en las plantaciones sometidas a una ordenación intensiva.

La Comisión felicitó a los autores y examinó las posibles opciones para una mayor colaboración en el ámbito regional en lo relativo a las plantaciones. Se remitió la cuestión a la Mesa de Suplentes para un examen más detallado.

La Comisión recomendó que el Grupo de Trabajo sobre Inventario Forestal, Seguimiento y Evaluación incluyera en su mandato las actividades en curso en el marco de los procesos relacionados con criterios e indicadores, y se asegurara de que se tuvieran en cuenta los criterios e indicadores del Proceso de Montreal al abordar el seguimiento y evaluación en el ámbito regional. Asimismo observó la importancia de la relación entre indicadores locales y nacionales.
## Mexico list of species identified as high, global, regional and/or national priority.

Legend in Appendix 3

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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<td>1</td>
<td>1 2 2 1 1</td>
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<td>1 1 1 1 1</td>
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<td>(E) populations</td>
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<td>3</td>
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<td>PVT, PGT</td>
</tr>
<tr>
<td>P. oocarpa</td>
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<td>3</td>
<td></td>
<td></td>
<td>PVT, PGT</td>
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</table>
### 2. REGIONAL UPDATE FOR MEXICO

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<tr>
<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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</thead>
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</tbody>
</table>

28
Este documento presenta un panorama actualizado sobre los recursos genéticos forestales de la sub-región América Central, basado principalmente en los resultados de un proceso de consulta y discusión a nivel regional organizado por la FAO sobre “El estado de los recursos genéticos forestales en Cuba, México y América Central, y elaboración de un plan de acción regional para su conservación y uso sostenible”, que culminó con la realización de un taller en el CATIE, Costa Rica, del 25 al 29 de noviembre del 2002.

Este proceso se inició en marzo del 2001, con la colaboración de los Países Bajos, IPGRI, DANIDA Forest Seed Centre y IUFRO, para apoyar en: i) la preparación de estudios sobre el estado de los recursos genéticos forestales en estos países por parte de expertos nacionales, ii) la preparación de una síntesis regional basada en los informes nacionales, y iii) la realización de una reunión para discutir y completar el estudio regional, fijar prioridades en cuanto a especies y actividades y preparar un plan de acción para la conservación y utilización sostenible de los RGF de la subregión. Además de los siete países del istmo Centroamericano, la FAO decidió incluir otros países que presentan condiciones ecológicas similares, al menos en partes de su territorio, específicamente Cuba y México.

En diciembre del 2001 y por encargo de la FAO, el M.Sc. Fernando Patiño realizó una visita a todos los países involucrados (con excepción de Costa Rica, donde los contactos estuvieron a cargo del suscrito), para informar a las autoridades gubernamentales acerca de esta iniciativa y contactar a consultores para la realización de los estudios nacionales. Los documentos nacionales fueron remitidos al suscrito, quien se encargó de elaborar una síntesis regional y un plan de acción para la conservación y uso sostenible de los RGF.

Para discutir y completar el documento, se realizó un taller en la sede del CATIE, Costa Rica, del 25 al 29 de noviembre del 2002, con participación de autoridades de la FAO, IPGRI, CATIE, los consultores nacionales e invitados de Danida, CAMCORE, IUFRO y CCAD.

Uno de los resultados de este taller fue una lista actualizada de especies prioritarias de importancia regional. Para fines de este informe, se incluyeron únicamente las especies que fueron mencionadas como prioritarias por al menos tres de los países de la subregión, y por lo tanto excluye especies consideradas importantes por solo uno o dos países. Por lo tanto, la lista presentada aquí es más corta que la resultante del taller. Es necesario indicar que las listas de especies prioritarias no son definitivas, sino que deberán ser revisadas y actualizadas con regularidad. Sin embargo, son útiles al representar la visión actual de los expertos y sirven de referencia para que decidores, donantes e investigadores puedan dirigir mejor sus esfuerzos. La lista de especies se muestra en el Anexo I.

1. Aspectos políticos e institucionales

No se nota ninguna nueva iniciativa en este campo. Durante la elaboración del informe regional se hizo evidente la existencia en los países una gran cantidad de leyes, reglamentos y normas en materia de recursos forestales, sin duda con la sana intención de actualizar los procedimientos en relación con el nuevo entorno económico y ecológico a nivel nacional e internacional, tomando en cuenta las nuevas corrientes y la mayor conciencia y preocupación en cuanto a la protección del ambiente. En ocasiones, sin embargo, existen serios problemas para la implementación práctica de la legislación vigente, se genera confusión y contradicciones entre las diferentes leyes y reglamentos, no se sabe con certeza cuál es la entidad responsable de su aplicación, y todo esto provoca un exceso de trámites burocráticos para llevar a cabo una actividad determinada.
El exceso de leyes y la poca claridad en su interpretación y cumplimiento más bien inhibe la actividad forestal, no han sido efectivas en mitigar el deterioro ambiental asociado a la deforestación, no hay una integración de los programas forestales nacionales con estrategias nacionales de biodiversidad, y hay poco o ningún control sobre la entrada y salida de germoplasm del país.

2. Aspectos técnicos y biológicos

2.1 Programas

En esta área degraciadamente ha habido pocos avances, y por el contrario, se nota un detenimiento en las acciones. El CATIE, quien tradicionalmente había liderado las actividades en este campo en la región, ha venido enfrentando problemas financieros y en consecuencia concluyó la mayoría de sus programas en este campo y no hay actualmente nuevas iniciativas ni ninguna institución que tome el liderazgo a nivel regional. Únicamente permanece un proyecto de investigación en caoba y se mantiene el Banco de Semillas Forestales, pero dedicado exclusivamente a labores de capacitación técnica y colecta y distribución de semillas básicamente con fines comerciales. También se mantienen algunos bancos de semillas en la región, pero con la finalización del Proyecto de Semillas Forestales (CATIE-Danida), que venía dándoles apoyo técnico y financiero, sus acciones se han visto seriamente limitadas.

A nivel nacional no existen programas fuertes de mejoramiento genético en la región, con la excepción de algunas iniciativas de unas pocas empresas privadas en Costa Rica.

2.2 Amenazas, protección, conservación

Algunos países han tomado conciencia acerca de la necesidad de proteger los bosques y se han logrado reducciones importantes en las tasas de deforestación. La cifra global, sin embargo, sigue siendo alta, con más de 340.000 ha deforestadas por año. Nicaragua presenta la tasa más alta de deforestación anual, con 117.000 ha anuales. Con estas alarmantes cifras de eliminación de bosque, es claro que los recursos genéticos se encuentran seriamente amenazados. Además de las razones tradicionales (aprovechamiento para madera y otros productos, expansión de la agricultura y la ganadería, asentamientos humanos), la incidencia de incendios, plagas y desastres climáticos, principalmente huracanes, que han azotado la región de manera particularmente severa en los últimos años, han contribuido a la eliminación del recurso forestal. Con respecto a daños por plagas, solo en Nicaragua se reportaron pérdidas de 32.000 ha a causa del “gorgojo descortezador” que afectó la región central de ese país.

En los últimos años, sin embargo, ha habido un aumento en la conciencia ecológica, y muchos países de la subregión han hecho esfuerzos territorios en este campo. Es destacable que cinco de los ocho países incluidos poseen más de una cuarta parte de su territorio bajo alguna forma de protección, lo cual representa un esfuerzo técnico, humano y económico considerable por parte de los gobiernos de estos países (Cuadro 1).

América Central, según el esquema de clasificación de la IUCN, posee 411 áreas protegidas declaradas y 391 propuestas. Existen algunas reservas privadas en Costa Rica (85) y Guatemala (10), pero la mayoría son de propiedad nacional. El “turismo ecológico” en las reservas y parques nacionales se ha convertido en una fuente importante de ingresos en algunos países, especialmente en Costa Rica, donde este rubro alcanza el primer lugar en cuanto a generación de divisas y le ha otorgado al país una importante reputación a nivel mundial.

Los esfuerzos de conservación ex situ, por su parte, han sido limitados en la subregión, y han sido concebidos no como una estrategia integral y dirigida hacia ese propósito, sino como un producto secundario de otras actividades de mejoramiento, establecimiento de fuentes semilleras o programas de recolección, almacenamiento y distribución de semillas, generalmente involucrando un número limitado de especies de interés comercial.
La conservación de polen o de materiales in vitro es raramente practicada. Algunas organizaciones internacionales (CAMCORE, CIMMYT, CIAT, CATIE), mantienen colecciones importantes de unas especies selectas, principalmente en bancos de conservación o ensayos genéticos.

**Cuadro 1**: Porcentaje de territorio bajo protección en los países de la subregión

<table>
<thead>
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<th>País</th>
<th>Áreas protegidas (% de territorio nacional)</th>
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<td>Belice</td>
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<tr>
<td>Costa Rica</td>
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<tr>
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<tr>
<td>Panamá</td>
<td>26</td>
</tr>
<tr>
<td>Promedio</td>
<td>21</td>
</tr>
</tbody>
</table>

**2.3 Avances**

En cuanto a nuevos estudios en conservación, mejoramiento genético y biotecnología, destacan los siguientes trabajos:


El principal objetivo de este trabajo fue evaluar los recursos genéticos del cedro (*Cedrela odorata* L.) y estudiar las posibilidades para su uso eficiente. Se examinó la diversidad genética y diferenciación de poblaciones de varios países de Mesoamérica, y se evaluaron experimentos de campo y jardines de conservación. Hubo diferencias significativas entre procedencias para todas las variables estudiadas, incluyendo crecimiento en altura y diámetro, resistencia al barrenador y crecimiento del rebrote después del ataque. Los sistemas de cultivo que dieron mejor resultados en cuanto a crecimiento de *C. odorata* fueron los de cafetales maduros con *C. odorata* plantado entre líneas de café. Los ataques del barrenador también fueron inferiores en mezclas con café maduro que en cafetales recién plantados.


El objetivo de la investigación fue contribuir con el desarrollo de un método de micropropagación de genotipos seleccionados de *C. odorata*. Las bajas concentraciones de BAP fueron más eficaces para promover brotación de los explantes nodales de cedro y pueden señalarse como potencialmente útiles para la micropropagación, aunque los brotes fueron muy pequeños y dificultaron su separación posterior para pasar a la fase de desarrollo. Se recomienda realizar un subcultivo en un medio con carbón activado para remover residuos de citocinina utilizada en multiplicación y favorecer así el alargamiento de los brotes obtenidos.

**3. Aspectos operacionales y organizacionales**

**3.1 Taller regional: “Estado de los recursos genéticos forestales en Cuba, México y América Central, & Plan de acción regional para su conservación y uso sostenible”**

Como ya fue mencionado, en noviembre del 2002 se llevó a cabo dicho evento en Costa Rica, organizado por la FAO y el CATIE, con el apoyo financiero del convenio FAO-Países Bajos. El taller contó con la participación de autoridades de la FAO, IPGRI, CATIE, los consultores nacionales e invitados de Danida, CAMCORE, IUFRO y CCAD.
Como resultado del taller se discutió la síntesis regional y se completó un plan de acción regional para la conservación y uso sostenible de los RGF. Sin embargo, como se mencionó anteriormente, el CATIE, quien mantenía el liderazgo regional en este campo, concluyó sus programas en RGF, de manera que también finalizaron los esfuerzos que se venían desarrollando en la región en las áreas de educación, capacitación, investigación, certificación de semillas, etc. Es claro que para que una iniciativa de esta magnitud y complejidad pueda tener éxito, no basta con un plan y los buenos deseos de llevarlo a cabo. Será crucial la participación de una entidad central con recursos financieros y humanos adecuados, que asuma el liderazgo, coordinación y seguimiento en la eventual implementación de la estrategia regional.

3.2 Proyecto de árboles Mesoamericanos; Manual de consulta para extensionistas


3.3 Red Latinoamericana sobre recursos genéticos forestales

En noviembre del 2002 se conformó esta red a raíz de la realización de un curso sobre el tema en España, pero aparte de su conformación no ha habido acciones ni avances posteriores.

4. Conclusiones

La subregión es considerada una de las principales áreas del mundo en cuanto a diversidad genética vegetal. Pocas áreas del trópico de tamaño similar muestran tal variedad de topografía, clima, suelos y vegetación, incluyendo más de 4000 especies forestales. Es evidente que los países han hecho esfuerzos para conservar áreas boscosas, y estas actualmente cubren cerca de 17 millones de hectáreas, lo que equivale a un 33% del territorio. Fuera de las áreas protegidas, sin embargo, la deforestación sigue siendo un problema de grandes magnitudes. La tasa de deforestación de esta subregión se mantiene en 341.000 ha, con Nicaragua mostrando la mayor cifra para la subregión (117,000 ha anuales). Además de la eliminación del bosque de parte del humano, la incidencia de incendios, plagas y desastres climáticos, han contribuido de manera importante en la eliminación del recurso forestal.

Las plantaciones forestales se han incrementado en los últimos años, fomentadas principalmente por la implementación de esquemas de incentivos en algunos países. Sin embargo, las tasas de plantación anual son bajas y el área total de plantaciones para toda la subregión apenas sobrepasa las 940.000 ha, de las cuales cerca del 50% (482,000 ha) corresponden a Cuba.

Ante este panorama, es claro que los recursos genéticos se encuentran seriamente amenazados. La conservación ha estado enfocada al establecimiento de áreas protegidas, y se deben reconocer los esfuerzos en este campo, pero estas no siempre han sido establecidas siguiendo criterios científicos que garanticen la protección efectiva de ciertas especies o ecosistemas, ni tomando en consideración aspectos de variación genética de las especies. Las acciones de mejoramiento genético y conservación en situ se han limitado a unas pocas especies de importancia económica, y han consistido básicamente en el establecimiento de algunos ensayos de procedencias y progenies, y áreas para la producción de semilla, principalmente rodales semilleros.

No existe en la actualidad una estrategia regional integrada que garanticen el manejo, la conservación y utilización sostenible de los recursos genéticos forestales, ni una entidad que lidere los esfuerzos en este campo.
Entre los obstáculos principales para el manejo y conservación de los recursos genéticos forestales en los países destacan:

- Falta de presupuesto y en ocasiones, de voluntad política de parte de los decisores para implementar iniciativas en este campo y darles seguimiento en el largo plazo.
- Falta de información sobre muchas especies, su distribución, variabilidad, biología, manejo.
- Insuficiente disponibilidad de germoplasma de alta calidad genética y fisiológica, especialmente en el caso de especies nativas, para suplir las necesidades de reforestación, investigación y conservación ex situ.
- Falta de educación y conciencia en gran parte de la población acerca de la importancia de conservar la biodiversidad y proteger el ambiente en general.
- Problemas sociales (principalmente pobreza), que empujan la población hacia las áreas protegidas en busca de tierras, madera y otros productos del bosque.
- Falta de capacidad técnica y económica para llevar a cabo los estudios y acciones necesarias.

Sin embargo, se reconoce la existencia de una serie de opciones y ventajas en la subregión que pueden generar un cambio positivo en el futuro, entre ellas:

- Todavía existe disponibilidad de recursos forestales pese al alto índice de deforestación, y aun existe la oportunidad de tomar decisiones que promuevan el manejo sostenible de estos recursos.
- Existe por parte de la empresa privada una disposición creciente a cooperar con el Estado en el sentido de asegurar el abastecimiento de materia prima forestal.

Ante este panorama, se requiere:

- Fortalecer los programas de investigación forestal (biología, mejoramiento genético forestal, semillas, silvicultura), principalmente con especies nativas, para garantizar la conservación, domesticación y uso racional de dichas especies.
- Fortalecer los programas de reforestación con especies maderables y de uso múltiple, para contribuir a suplir la demanda de estos productos y reducir la presión sobre los bosques naturales remanentes.
- Fortalecer los programas de educación y capacitación para profesionales y técnicos forestales.
- Fortalecer los programas de educación ambiental en la población tanto urbana como rural, para crear mayor conciencia acerca de la necesidad e importancia de proteger los recursos forestales y la biodiversidad, y principalmente,
- La participación de una entidad central con recursos financieros y humanos adecuados, que asuma el liderazgo, coordinación y seguimiento en la eventual implementación de una estrategia regional para la conservación y manejo de los recursos genéticos forestales en la subregión.
### Anexo 1. Especies prioritarias para la sub-región América Central.

<table>
<thead>
<tr>
<th>ESPECIES</th>
<th>OPERACIONES / ACTIVIDADES</th>
<th>OBSERVACIONES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USOS FINALES</td>
<td>Exploración y recolección</td>
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<tr>
<td>Astronium graveolens</td>
<td>x</td>
<td>x x 2 2 2 2 2 2 1 1</td>
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<td>Bombacopsis quinata</td>
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<tr>
<td>Calophyllum brasiliense</td>
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</tr>
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<td>Calycophyllum candidissimum</td>
<td>x</td>
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</tr>
<tr>
<td>Carapa guianensis</td>
<td>x</td>
<td>x x 2 2 2 2 2 2 2 2</td>
</tr>
<tr>
<td>Cedrela odorata</td>
<td>x</td>
<td>x x 2 1 1 1 1 1 1 1</td>
</tr>
<tr>
<td>Ceiba pentandra</td>
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<td>x x 2 2 2 3 2 2 3 3</td>
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<tr>
<td>Conocarpus erectus</td>
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<td>Cordia alliodora</td>
<td>x</td>
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</tr>
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<td>Cupressus lusitanica</td>
<td>x</td>
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</tr>
<tr>
<td>Cybistax donnell-smithii</td>
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<td>Dalbergia retusa</td>
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</tr>
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<td>Enterolobium cyclocarpathum</td>
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<td>Hymenea courbaril</td>
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<tr>
<td>Leucocarya leucocephala</td>
<td>x</td>
<td>x x 3 2 3 2 3 2 2 3</td>
</tr>
<tr>
<td>Myrocoxyylon balsamum</td>
<td>x</td>
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</tr>
<tr>
<td><em>Pinus</em> caribaea var hond.</td>
<td>x</td>
<td>x x 2 2 2 2 1 1 1 1</td>
</tr>
<tr>
<td><em>Pinus</em> maximinoi</td>
<td>x</td>
<td>x x 2 2 1 1 1 1 1 1</td>
</tr>
<tr>
<td><em>Pinus</em> oocarpa</td>
<td>x</td>
<td>x x 2 2 1 1 1 1 2 2</td>
</tr>
<tr>
<td><em>Pinus</em> tecunumani</td>
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<tr>
<td><em>Swietenia</em> macrophylla</td>
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</tr>
<tr>
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<td><em>Tabebuia</em> rosea</td>
<td>x</td>
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</tr>
<tr>
<td><em>Terminalia</em> amazonia</td>
<td>x</td>
<td>x x 1 1 1 1 1 1 1 1</td>
</tr>
<tr>
<td><em>Vochysia</em> guatemalensis</td>
<td>x</td>
<td>x 2 2 1 2 2 2 2 2 1</td>
</tr>
</tbody>
</table>
Levenda:
1: alta prioridad
2: acción rápida
3: acción importante pero menos urgente que 1 y 2

Usos finales
1. Madera industrial (trosas, madera aserrada, madera de construcción, madera contrachapada, tableros de astillas y de partículas, pulpa de madera)
2. Productos industriales no madereros (gomas, resinas, aceites, taninos)
3. Leña, postes, palos (leña, carbón vegetal, madera en rollo utilizada en agricultura, madera para tallar)
4. Otros usos, bienes y servicios (alimentos, uso medicinal, forraje, estabilización y mejora de tierras, sombra, protección, valores ambientales). La información complementaria se da a veces en la columna de "Observaciones".

Exploración:
5. Información biológica (distribución natural, taxonomía, genecología, fenología, etc.)
6. Obtención de material genético para evaluación

Evaluación:
7. In situ (estudios poblacionales)
8. Ex situ (ensayos de procedencias y progenies)

Conservación:
9. In situ
10. Ex situ

Utilización de material genético:
11. Producción de semilla para plantaciones
12. Selección y mejoramiento
En el Cono Sur de América Latina la actividad forestal productiva se basa esencialmente en plantaciones forestales, que en la mayoría de los casos se hacen con especies introducidas. Las actividades relacionadas a los recursos genéticos nativos en general son escasas, aun cuando han ido en aumento, en relación a períodos anteriores.

En Argentina, Chile y Uruguay existen importantes incentivos a la forestación, lo cual se ha traducido en un rápido desarrollo de la actividad forestal en base a especies de rápido crecimiento, en todos los casos con especies introducidas desde otras latitudes. Argentina cuenta con una superficie forestada algo mayor a 1 millón de hectáreas; Chile 2.2 millones de hectáreas y Uruguay cerca de 500 mil hectáreas. En Paraguay, aun cuando existen mecanismos estatales de fomento a la forestación, el establecimiento de plantaciones forestales es bastante incipiente.

El desarrollo de las plantaciones forestales ha generado importantes avances en el área de mejora genética, especialmente en el ámbito de las empresas privadas. El país con mayor desarrollo en esta área es Chile, que inició un programa de mejoramiento genético de Pinus radiata hace 25 años, logrando en este período importantes avances. En los últimos 10 años, se agrega el mejoramiento genético de diversas especies del género Eucalyptus.

[En Argentina todavía las empresas plantan una alta proporción con semillas importadas, especialmente en el caso de Pinus spp., pero existen importantes avances, ya que se han establecido huertos clonales de primera generación que deben entrar en producción en los próximos años.]

Como ha sido tradicional en estos países, la atención se ha centrado en las especies introducidas, quedando las especies nativas relegadas a un segundo plano. A pesar de esto, en los últimos años se nota una mayor preocupación por los recursos genéticos nativos. Tal es el caso de Chile donde se han iniciado una serie de programas destinados a la conservación y mejoramiento de algunas especies nativas de interés comercial.

Las acciones de preservación y recuperación de recursos genéticos forestales amenazados son bastante escasas en los países del Cono Sur.

1. Antecedentes generales

Los países del cono Sur de América Latina se caracterizan por la existencia de bosques subtropicales y especialmente por la presencia de bosques templados húmedos, en Argentina y Chile.

Durante los dos últimos años no se presentan cambios de importancia en relación a los recursos forestales y a las principales tendencias en relación a su existencia. La mayoría de los países tiene activos programas de forestación, principalmente con especies introducidas y en general, con la excepción de Paraguay, asigna menor importancia, desde el punto de vista de la producción de madera, a los recursos forestales nativos.

Aun cuando los bosques nativos siguen disminuyendo en términos de superficie, existe una tendencia clara hacia la disminución de la corta de bosques naturales. El único país de la Sub-Región que mantiene altas tasas de deforestación es Paraguay y en menor medida Argentina, donde el monte de la región semiarida del norte sigue siendo eliminado para la habilitación de terrenos agrícolas; en Chile existe una clara declinación en la deforestación de áreas con bosques naturales en relación a la década anterior. En Uruguay, la escasa cubierta de bosques naturales se mantiene.

Los recursos forestales existentes en los países del Cono Sur de América Latina, incluyendo Paraguay se presentan en el Cuadro 1.
Cuadro 1: Los recursos forestales de los países del cono Sur, incluyendo Paraguay.

<table>
<thead>
<tr>
<th>PAÍS</th>
<th>BOSQUES NATURALES</th>
<th>PLANTACIONES</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coníferas</td>
<td>Latifoliadas</td>
</tr>
<tr>
<td>Argentina</td>
<td>33.722.000</td>
<td>509.300</td>
<td>416.700</td>
</tr>
<tr>
<td>Chile</td>
<td>13.430.600</td>
<td>1.530.000</td>
<td>543.661</td>
</tr>
<tr>
<td>Paraguay</td>
<td>20.270.280</td>
<td>s/i</td>
<td>s/i</td>
</tr>
<tr>
<td>Uruguay</td>
<td>670.000</td>
<td>s/i</td>
<td>s/i</td>
</tr>
<tr>
<td>TOTAL</td>
<td>68.092.880</td>
<td>s/i</td>
<td>s/i</td>
</tr>
</tbody>
</table>

(hectáreas)

2. Aspectos de política e institucionalidad

2.1 Argentina

La Secretaría de Ambiente y Desarrollo Sustentable ha modificado su estructura organizacional, reemplazando la dirección Nacional de Desarrollo Sustentable por la Dirección Nacional de Desarrollo Sustentable y Conservación de la Biodiversidad (DNRRNyCB), lo cual debería significar un cambio positivo en términos de la conservación de los recursos genéticos forestales y de la diversidad biológica en general. La DNRRNyCB tiene como responsabilidades primarias elaborar propuestas y ejecutar políticas, programas y proyectos vinculados a la gestión de los recursos naturales y conservación de la biodiversidad, como asimismo al desarrollo e implementación de estrategias nacionales y regionales orientadas a lograr la sostenibilidad social, económica y ecológica.

Entre las diversas acciones que se propone desarrollar esta organización se destacan:

- Proponer y ejecutar políticas y programas tendientes a lograr un conocimiento integral de los recursos naturales y la diversidad biológica del país para su valoración y desarrollo sustentable.
- Proponer y ejecutar políticas y programas para la conservación, recuperación, protección y uso sustentable de la flora y fauna silvestre y las masas forestales nativas, en forma coordinada con entes públicos o privados competentes en la materia.
- Proponer la Estrategia Nacional sobre Diversidad Biológica para alcanzar los objetivos de conservación de la diversidad biológica, la utilización sostenible de sus componentes y la participación justa y equitativa en los beneficios que se deriven de la utilización de los recursos genéticos.
- Proponer y ejecutar políticas y programas vinculados con el uso de los recursos genéticos y el acceso a los mismos.

Otra instancia relacionada con la conservación y uso de los recursos genéticos forestales es la Comisión Nacional Asesora para la Conservación y Utilización Sostenible de la Diversidad Biológica (CONADIBIO), creada mediante el Decreto N° 1347/97, que tiene las siguientes funciones:

- Asesorar a la Autoridad de Aplicación en todos aquellos aspectos relacionados con la implementación de la Ley N. 24.375 que ratifica la participación de Argentina en el Convenio sobre la Diversidad Biológica.
- Proponer y propiciar acciones conducentes al logro de los objetivos y metas contenidas en el Convenio sobre la Diversidad Biológica.
- Considerar y aprobar el Plan de actividades para ser propuesto a la Autoridad de Aplicación.
- Elaborar y proponer a la Autoridad de Aplicación, para su aprobación, la Estrategia Nacional sobre la Diversidad Biológica.

1 Situación de los Bosques del Mundo, FAO; página web SAGPyA.
2 Catastro y Evaluación de recursos Vegetacionales Nativos de Chile. (1999); Estadísticas Forestales, Instituto Forestal, Octubre, 2003.
3 Estado actual del manejo forestal en Paraguay, Rafael Ortiz, 2001
4 Situación de los Bosques del Mundo, FAO, 2003
Es misión de la Coordinación de Conservación de la Diversidad Biológica (dependiente de la DNRNyCB) impulsar y apoyar el funcionamiento de dicha Comisión, proporcionando los instrumentos administrativos y técnicos necesarios para una adecuada gestión.

La Secretaría integra también la CONABIA (Comisión Nacional Asesora de Biotecnología Agropecuaria), pero en ella no se han tratado, hasta la fecha, temas relacionados con especies forestales.

El Servicio de Agricultura, Ganadería, Pesca y Alimentación (SAGPyA) tiene la responsabilidad de regular la actividad relacionada con plantaciones forestales.

En cuanto a la normativa y legislación referida a los recursos genéticos, un hecho importante es la aprobación de la normativa para la liberación de organismos vegetales genéticamente modificados, a través de decreto del Servicio Agrícola, Ganadero, Pesca y Alimentación que regula la “Liberación al Medio de Organismos Vegetales Genéticamente Modificados”, que entrará en vigencia el 1 de enero de 2004. En los últimos dos años no se han producido otros cambios de importancia en aspectos relativos a las políticas relacionadas con los recursos genéticos forestales ni a las instituciones relacionadas.

En relación a otras convenciones, se destaca la activa participación de Argentina en diversas reuniones relacionadas con la Convención de Cambio Climático, incluyendo reuniones regionales, la sesión de Organos subsidiarios y las conferencias de las partes realizadas en el período.

Argentina destaca el gran potencial que tiene el sector forestal como sumidero de carbono y el notable incremento en las plantaciones, debido a las políticas de promoción aplicadas por el Estado, que han permitido aumentar la tasa de plantación anual desde 20 mil hectáreas en 1992 a 100 mil hectáreas en los últimos años. La meta es plantar 2 millones de hectáreas en los próximos 10 años, con importantes beneficios en captación de carbono; reducción de la presión sobre bosques nativos; reducción de inundaciones; mejoría del paisaje; creación de 120 mil nuevos puestos de trabajo y desarrollo industrial, con inversiones estimadas de US$ 5 000 millones en el período.

También se destaca la participación de Argentina en el Proceso de Montreal, y la formación de un grupo de trabajo entre los países del Cono Sur de América Latina (Argentina, Chile, Uruguay) destinado a colaborar en la implementación del proceso.

2.2 Chile

Durante los últimos dos años (2002-2003) no se han producido cambios en las instituciones relacionadas a los recursos genéticos forestales, ni en las políticas que pueden, directa o indirectamente, afectar dichos recursos. Las políticas y la administración de la legislación relativa a los recursos forestales depende del Ministerio de Agricultura, que cuenta con dos instituciones principales, la Corporación Nacional Forestal (CONAF) que es el servicio forestal del Estado y el Instituto Forestal, organismo de investigación. Aun cuando el proyecto legislativo que proponía la creación de una Subsecretaría Forestal fue retirado del Parlamento, aun se considera la idea en ciertos círculos políticos.

Durante los últimos años (1999-2002) se produce un alza en las tasas forestación, en relación a los tres años anteriores, que habían marcado una considerable baja en relación a la primera mitad de la década de los 90, cuyo promedio de plantación fue cercano a 112.000 ha anuales. (INFOF, 2002). Dicho cambio responde, en cierta medida a las modificaciones en los reglamentos de la ley de incentivos a la forestación, que se hicieron en el año 2000.

Cabe destacar que continúa la discusión sobre una nueva legislación sobre los recursos forestales nativos, que ya cumplió 10 años de trámite legislativo.
El 2003 se presentaron nuevas indicaciones al proyecto de ley, que surgen de una discusión ampliada, con mayor participación de los distintos grupos de interés. No hay avances, en relación al 2001, en cuanto a una nueva ley para el servicio forestal chileno, que pretende darle mayores atribuciones para el cumplimiento de sus funciones. Tampoco se ha avanzado en la discusión de la ley que permite la creación de áreas silvestres protegidas privadas, con el apoyo del Estado.

En relación al manejo forestal, se han registrado importantes avances en el tema de la certificación de manejo forestal sostenible. Lo más destacable es el desarrollo de un estándar de certificación chilena, CERTFOR Chile, que ha sido reconocido por la norma de certificación pan europea. La principal empresa forestal del país está en proceso de certificación de acuerdo a esta norma. A esto hay que agregar que varias empresas han optado por la certificación bajo las normas FSC. A la fecha, en Chile existen 250.754 hectáreas de bosques cuyo manejo forestal ha sido certificado por el Forest Stewardship Council (FSC), todas pertenecientes a empresa de tamaño medio. También hay empresas con certificación FSC para sus cadenas de custodia.

La gestión ambiental de las empresas certificadas mediante la norma 14001 del sistema ISO, alcanza a 1.735.516 hectáreas e incluye a las principales 12 empresas del país.

Importante destacar que Chile inicia las primeras acciones destinadas a establecer un monitoreo permanente de los ecosistemas nativos, incluyendo recursos madereros; diversidad biológica; agua; suelo, avanzando de esta forma en el cumplimiento de acuerdos internacionales y respondiendo a la mayor exigencia impuesta por la sociedad en cuanto al manejo y destino de los bosques. La información sobre este programa de monitoreo de los recursos forestales se encuentra en www.infor.cl.

En el ámbito internacional, Chile ha seguido participado activamente en la Convención de Cambio Climático; Convenio para la Diversidad Biológica; Proceso de Montreal. Cabe destacar que la última conferencia de las partes de CITES, se realizó en Santiago de Chile, en noviembre de 2002.

2.3 Paraguay

De los cuatro países de esta sub-región, Paraguay es el que continúa con mayores problemas en cuanto a la conservación de los recursos forestales nativos, con una tasa estimada de deforestación cercana a las 300.000 ha. anuales, sólo en la Región del Chaco, con un gran impacto en la conservación de la diversidad biológica y notorios efectos en el suelo y el agua. (Ortiz, 2001)

La forestación ha registrado un avance importante, gracias al impulso de la Ley 536/95 de Fomento a la Forestación y Reforestación, pero todavía se trata de una actividad bastante marginal, especialmente si se compara con los países vecinos. Como señala la Tabla N° 1, en 1998 el área con plantaciones forestales alcanzaba a 43,000 ha.

En cuanto al uso de la tierra en el sector agropecuario y forestal, sigue imperando el modelo corto-placista, donde no es contemplado un ordenamiento racional del uso de la tierra en los procesos de planificación del desarrollo rural. Al respecto, recientemente se ha aprobado el Estatuto Agrario, instrumento orientado a lograr un desarrollo integral sostenible.

Con la Ley 1561/00, que crea el SISNAM (Sistema Nacional del Ambiente), el CONAM (Comisión Nacional del Ambiente), y la SEAM (Secretaría del Ambiente), se pretende mejorar los mecanismos necesarios para una más efectiva integración de las consideraciones ambientales en los procesos de planificación económica del país.

Actualmente, se encuentra en estudio en el Parlamento Nacional, el Proyecto de Ley que crea el Instituto Forestal Nacional, cuyo objetivo principal es otorgarle una mayor jerarquía a la administración forestal del estado.
2.4 Uruguay

La legislación sobre gestión y conservación de recursos genéticos forestales en Uruguay está estrechamente relacionada a las políticas nacionales vigentes para los bosques (nativos y plantados) y los recursos naturales en general (Agua, Suelos, Areas Protegidas). En este marco, la Ley Forestal 15.939 de 1987 es el instrumento legal de mayor importancia ya que reglamenta: (i) todas las políticas de fomento de las plantaciones con especies introducidas, con la delimitación de zonas de prioridad forestal, (ii) la asignación de subsidios para la actividad forestal en el país y (iii) la protección de los bosques nativos. A esta ley, conviene agregar otras leyes sobre recursos naturales (Agua, Suelos y Areas Protegidas) que tienen relaciones directas o indirectas con la gestión y conservación de los recursos genéticos forestales.

En la última década, diferentes convenios internacionales suscritos por el Uruguay configuraron nuevos marcos legales a tomar en cuenta. La Convención sobre Biodiversidad, el Convenio Marco de las Naciones Unidas sobre Cambio Climático y el Procesos de Montreal para el Manejo Sustentable de los Bosques son algunos de los más destacables. De manera resumida, el marco legal de referencia es bastante sólido y consiste en los siguientes instrumentos nacionales e internacionales:

- Ley Forestal 15.939
- Ley de Semillas
- Ley de Impacto Ambiental
- Ley de Areas Protegidas
- Sistema Nacional de Recursos Fitogenéticos (en preparación)
- Ratificación de la Convención sobre Biodiversidad
- Integración al Proceso de Montreal
- Ratificación del Protocolo de Kioto y del Mecanismo de Desarrollo Limpio.

De esta manera, la legislación sobre recursos genéticos forestales en su dimensión actual es, en gran medida, la resultante de los debates nacionales e internacionales en torno al uso sustentable de los bosques y de manera más amplia a la temática de desarrollo económico sustentable. Los instrumentos legales son, pocas veces, exclusivamente dedicados a los recursos genéticos forestales y derivan, por lo general, de la puesta en marcha de políticas forestales, agrarias y medioambientales promovidas por instituciones nacionales (Ministerio de Ganadería y Pesca, el Ministerio de Viviendas, Ordenamiento Territorial y Medio Ambiente, etc.) e intergubernamentales no necesariamente dedicadas exclusivamente a la actividad forestal. Esta situación produce solapamientos y hasta contradicciones, y, plantea la necesidad de una mayor coordinación institucional en el ámbito nacional, regional e internacional.

En resumen, a pesar de la proliferación de marcos legales nacionales e internacionales destinados a la gestión y conservación de los recursos naturales y de los bosques, pocas leyes son exclusivamente dedicadas a los recursos genéticos forestales. La existencia de esta vasta legislación y el aumento en la conciencia ambiental en los últimos años, no implican necesariamente que los recursos genéticos forestales estén recibiendo una mayor atención y un adecuado apoyo de parte de los políticos y quienes toman las decisiones.

El año 2000 se promulgó la Ley 17.234 que establece la Creación y Gestión de un Sistema Nacional de Areas Naturales Protegidas. Esta ley es de amplio impacto en la conservación de los recursos fitogenéticos.

Modificación de la Ley Forestal. En Mayo de 2002, a través de un Decreto del Presidente de la República, se modifica el Decreto N°849/88 de 1988, con el fin de mejorar los mecanismos de protección y combate de incendios forestales.

En relación a los acuerdos internacionales, Uruguay destaca su participación en el Proceso de Montreal, ya que organizó la última reunión del grupo en Abril de 2003.
Se destaca la creación del Comité de Recursos Fitogenéticos, para lograr una inclusión del tema forestal en la educación escolar y universitaria.

3. Aspectos técnicos y biológicos

3.1 Argentina

i) Recursos nativos

En relación a los RGF nativos se destaca el programa de Mejoramiento Genético y Silvicultura de los Algarrobos y el Caldén. En Argentina existen 28 especies del Género Prosopis, con una alta variabilidad inter e intra específica. De estas, seis especies concentran la atención por la calidad de sus maderas y por su posibilidad de uso en programas silvopastorales: Prosopis chilensis; Prosopis flexuosa; P. alba; P. nigra; P. hassleri y P. caldenia.

El programa tiene como objetivo evaluar el recurso constituido por estas especies; establecer un programa de mejora orientado a mejorar la calidad de la madera y forraje y establecer los mecanismos de difusión del material genéticamente mejorado. Se destacan el programa de mejoramiento genético de Prosopis alba, en la Provincia de Santiago del Estero, donde se han establecido ensayos de orígenes (procedencias) y progenies. Además se ha iniciado un nuevo programa de selección destinado a la conservación ex-situ y al establecimiento de un huerto semillero clonal.

En el Chaco árido argentino INTA en conjunto con la Facultad de Ciencias Agropecuarias de la Universidad Nacional de Córdoba está llevando a cabo un proyecto de conservación y mejoramiento genético de Prosopis chilensis y Prosopis flexuosa. Estas dos especies e híbridos de las mismas, juegan un importante papel en recuperación de tierras agrícolas degradadas, que están siendo abandonadas por su baja productividad.

El programa, luego de identificar especies e híbridos, ha establecido una población base para cada una de las especies, formada por dos sub-poblaciones aisladas. Cada sub-población se utilizará como ensayo de progenies y luego de una selección, como huerto semillero. Además, cada sub-población dará origen a una segunda generación de ensayos de progenie, que seguirá el mismo tratamiento que la primera.

Paralelamente a la instalación de las poblaciones base, se instalarán huertos clonales, con material de los árboles seleccionados en las poblaciones naturales.

El programa también considera el trabajo con híbridos, lo que permite suponer la existencia de híbridos naturales con cierta estabilidad, producto de un proceso microevolutivo, lo que permitiría emplearlos como material base para el mejoramiento.

El programa desarrollado por INTA y la Universidad Nacional de Córdoba también considera estudios sobre Prosopis alba y Prosopis nigra, especies que se desarrollan en áreas de mayor precipitación.

En la región patagónica los estudios se concentran en los Nothofagus caducifolios, especialmente en Nothofagus nervosa; N. obliqua y N. pumilio.

ii) Plantaciones

En relación a las plantaciones con especies de rápido crecimiento hay una importante actividad. Argentina cuenta en la actualidad con una superficie forestada que supera levemente el millón de hectáreas.
Se identifica claramente un polo de desarrollo, que concentra casi el 60 % de las plantaciones del país, en la región denominada “Mesopotámica” que comprende las provincias de Misiones, Corrientes y Entre Ríos. Las principales especies plantadas en esta área son *Pinus taeda*; *Pinus elliottii*, *Eucalyptus grandis* y *E. dunnii*. También se desarrollan, aun cuando en menor escala, programas de forestación con *Pinus caribaea* var. *hondurensis*; *P. caribaea* var. *bahamensis* y los híbridos de *Pinus elliottii x caribaea*, considerando las dos variedades antes mencionadas.

Otras especies introducidas que se plantan en el área:

*Melia azederach*; *Grevillea robusta*; *Toona ciliata* y *Pawonia sp.* (Kiri). Entre las novedades, se destaca el cultivo de *Chamaecyparis obtusa*, hinoki, orientada al mercado japonés. (SAGPyA Forestal, N° 27, 2003)

También existen plantaciones con especies nativas. En esta zona se establecen unas 500 ha. anuales con *Araucaria angustifolia*.

En el Noroeste las especies dominantes son *Pinus taeda*; *Pinus patula*; complejo *P. patula-tecunumanii-greggii* y *Eucalyptus grandis*.

Otra zona de importancia desde el punto de vista forestal es el Delta en la Provincia de Buenos Aires, donde existen vastas plantaciones de *Populus* (*P. deltoides*; *P. alba*; *P. nigra*; *P. x euroamericana, P. x interamericana*) y *Salix*, que se emplean como materia prima en la producción de papel y como madera aserrada. Se destaca un incremento en las perdidas en plantaciones de *Populus* debido al ataque del coleóptero *Platypus mutatus*.

Más al sur, en la región Pampeana la forestación se realiza con *Eucalyptus globulus ssp.globulus*; *E. globulus ssp. maidenii*; *E. dunnii* y *E. viminalis*. La actividad forestal en esta zona es incipiente.

En las Región andino - patagónica la forestación es a pequeña escala, empleando *Pseudotsuga menziesii*, *Pinus ponderosa* y *Pinus contorta* (*P. murrayana*) como las principales especies.

En cuanto a los programas de mejoramiento genético el mayor avance se ha logrado en las especies *Pinus taeda*, *P. elliottii* y el híbrido *Pinus elliottii x caribaea*. Las empresas privadas han jugado un importante rol en este avance. En el caso de *Pinus taeda* este avance se traduce en la instalación de huertos semilleros clonales de primera generación, bancos clonales y ensayos de progenie que incluyen colecciones de todo el rango de distribución de las especies. Los mejores resultados corresponden a procedencias de Florida, E.U.

La empresa Alto Paraná S.A. ha logrado establecer amplias bases genéticas de *Pinus taeda*, con más de 1000 progenies de selecciones locales y de Estados Unidos; Brasil; Sud África y Zimbabwe, que están siendo evaluadas en ensayos de progenie.

La empresa ha establecido 26 de huertos clonales, que han producido, el 2003, cerca de 500 kg. De semillas, lo que supera las necesidades de la empresa, permitiendo vender en el mercado local. La ganancia estimada, en relación a la semilla sin mejora es cercana al 30 %.

En cuanto a propagación vegetativa de estas especies, existe una empresa trabajando a nivel operativo en base a material de cruzamientos controlados, masificados por macropropagación (setos). La empresa Alto Paraná S.A. está produciendo 3 millones de plantas a partir de “cuttings” originados de plantas de cruzamientos controlados.

Existen proyectos de investigación en organogénesis, los que deberían dar resultados aplicables a partir de 2003. Una empresa esta trabajando, aunque fuera de Argentina, en protocolos de embriogénesis de *Pinus taeda*. 

En la zona Andino-patagónica se está iniciando un programa de selección de las especies *Pseudotsuga menziesii* y *Pinus ponderosa*, con el fin de establecer huertos semilleros clonales. También se ha ampliado la base genética de estas especies, con nuevos ensayos de procedencias y algún material de huertos semilleros de Estados Unidos.

En el caso de las especies del Género Eucalyptus, se registran importantes avances en el mejoramiento de *E. grandis*, lo que permitirá ir reemplazando la semilla que hoy se importa desde Sudáfrica y Australia. Hoy existen 3 huertos semilleros de esta especie, uno clonal. También se han establecido los primeros huertos semilleros de *E. dunnii* y *E. globulus ssp. globulus*.

### 3.2 Chile

#### 1) Recursos nativos

En relación a los recursos genéticos forestales nativos, se desarrolla una serie de proyectos destinados al mejoramiento y conservación de los mismos. Entre estos se destacan:

- Programa Nacional de Fuentes Semilleras, desarrollado por la Corporación Nacional Forestal (CONAF), cuyo objetivo es identificar fuentes de semillas de diversas especies, de modo de garantizar la colecta de semilla de fuentes conocidas. Además considera la habilitación de Areas Productoras de Semillas, de las especies comerciales más importantes.

El programa considera una serie de especies de valor comercial maderero, entre las que se destacan: *Nothofagus nervosa*; *N. obliqua*; *N. dombeyi* y *N. pumilio*. También considera especies importantes desde el punto de vista de la conservación, ya que se trata de especies amenazadas o en peligro de extinción. Entre ellas se considera *Nothofagus glauca*; *N. alessandri*; *Pitavia punctata*; *Gomortega keule* y *Beilschmedia miersii*.

- **Proyecto de mejoramiento genético de Raulí (Nothofagus nervosa ex N. alpina)**

Continúa desarrollándose el más importante programa de mejoramiento genético de una especie nativa, iniciado en 1983. Hoy se cuenta con huerto semillero clonal y se desarrollan cruzamientos controlados. En este programa participan la Corporación Nacional Forestal; el Instituto Forestal y la Cooperativa de Mejoramiento Genético, integrada por empresas; instituciones del Estado y la Universidad Austral.

- **Programa de mejoramiento Genético para especies del Género Nothofagus de interés económico.**

El programa considera el mejoramiento de las especies *Nothofagus nervosa ex N. alpina*; *Nothofagus obliqua* y *Nothofagus pumilio* las dos especies del género con mayor potencial desde el punto de vista de la producción de madera. El programa identifica las distintas procedencias de las especies; establece Areas Productoras de semillas; selecciona árboles “Plus”, y establece plantaciones para conservación ex – situ; establece ensayos de procedencias y progenies y define una estrategia de mejoramiento a largo plazo.

El proyecto cuenta con la participación de las Instituciones estatales CONAF e INFOR; la Universidad Austral de Chile y numerosas empresas privadas.

- **Programa de mejoramiento genético para las especies coigüe (Nothofagus dombeyi) y laurel (Laurelia sempervirens).**
El programa determinó la variabilidad genética de ambas especies, diferenciando procedencias; establecimiento de áreas productoras de semillas; establecimiento de huertos semilleros clonales; establecer protocolos de reproducción vegetativa.

El proyecto cuenta con la participación de las Instituciones estatales CONAF e INFOR; la Universidad Austral de Chile y numerosas empresas privadas.

Durante el período se produce un importante incremento en el número de programas de investigación relacionados con especies nativas con mayor potencial económico, desde el punto de vista de la producción de madera.

En cuanto a las especies con problemas de conservación, continúan los trabajos iniciados por la Corporación Nacional Forestal (CONAF) en relación a la conservación in situ y ex situ de varias especies. Las especies prioritarias son *Gomortega keule*; *Pitavia punctata*; *Beilschmiedia berteroana*; *Beilschmiedia miersii*; *Nothofagus alessandri*, N. glauca y *Prosopis tamarugo*. Durante el presente período de análisis, no se han iniciado nuevos programas.

**Plantaciones**

Las plantaciones forestales alcanzan a 2.1 millones de ha. Las principales especies plantadas son *Pinus radiata*; *Eucalyptus globulus* ssp. *globulus*; E. *nitens* y *Pseudotsuga menziesii*. Cabe destacar que existe un creciente interés por esta especie.

En cuanto al tipo de material genético empleado para el establecimiento de estas plantaciones, en el caso de *Pinus radiata* la mayoría de las empresas forestales está utilizando los mejores cruzamientos controlados a escala comercial. Los progenitores que se utilizan son determinados anualmente sobre la base de información genética generada a partir de una amplia red de ensayos de progenie. Para los análisis genéticos de estos ensayos se usa metodología que emplea BLUP, habiéndose desarrollado un sistema especial para tales efectos. Algunas empresas tienen establecidos ensayos clonales utilizando embriogénesis somática como metodología de producción.

Lo anterior significa que existe un excedente de semilla de Huertos Semilleros de Clones. Los procesos de mejora han continuado, incluyendo características de la madera y resistencia a plagas y enfermedades.

En el caso de *Eucalyptus globulus* ssp. *globulus*, los Huertos Semilleros de Clones están en una etapa de expansión productiva, estimándose que para el año 2004 las empresas que tienen programas propios podrán auto abastecerse en un 100% con este tipo de semilla.

Las empresas de mayor tamaño disponen de ensayos clonales (vía macropropagación de estacas) y ya se están haciendo las primeras plantaciones clonales a escala comercial.

Se está desarrollando una línea especial para producir una raza de *E. globulus* tolerante al frío y en el desarrollo de híbridos con varias otras especies con la finalidad de combinar características de calidad de madera, capacidad de propagación y adaptabilidad a sitios especiales. (Frío y sequía)

Se ha mejorado notablemente el proceso de cruzamientos, actualmente algunas empresas están utilizando el sistema OSP, o también denominado Cruzas Operacionales, para la producción masiva de semillas de progenitores sobresalientes.

En el caso de *Eucalyptus nitens*, la segunda especie de este género en importancia en Chile, la disponibilidad de semilla mejorada de Huerto Semillero de Clones es bastante más restringida que en los casos anteriores, los huertos son más jóvenes y aún en proceso de establecimiento en varios casos. Por lo tanto aún se utiliza semilla de Arbol Semillero, Areas Productoras de Semillas y semilla de las mejores procedencias que se han determinado de Australia.
En las tres especies se ha realizado selección de 2ª generación.

Dependiendo del objetivo de producción de cada empresa, se están utilizando las propiedades de la madera como otro elemento de decisión en el uso operacional del material genético.

Se desarrollan programas para zonas extremas. En la región semiárida se desarrollan procesos de selección en la búsqueda de mayor resistencia a la sequía, además de forma y crecimiento. Las principales especies son *Eucalyptus camaldulensis; E. cladocalyx* y *E. sideroxylon*. Se comienza a explorar la posibilidad de emplear híbridos.

Para zonas frías se ha intensificado el programa de mejoramiento de *Pseudotsuga menziesii*, ampliando la base de selección con nuevos ensayos de procedencia y progenie. Se están estableciendo los primeros huertos clonales. Se está iniciando un proceso de mejoramiento genético de *Pinus ponderosa*, para zonas frías andinas y regiones australes.

Durante los últimos años se han iniciado diversas investigaciones destinadas a introducir especies productoras de maderas de alto valor y de producción mixta (fruto-madera). Entre estas cabe destacar *Castanea sativa; Juglans regia; Prunus serotina*. También se ha activado la investigación sobre especies de los Géneros *Populus* y *Salix*. Otra especie que comienza a despertar interés, desde el punto de vista de la forestación es *Robinia pseudoacacia*. El interés por estas especies surge del programa de diversificación forestal que están impulsando las instituciones forestales del estado, CONAF e INFOR.

### 3.3 Uruguay

#### i) Recursos nativos

De manera resumida, las acciones técnicas dedicadas en el país a las especies nativas se caracterizan por los siguientes aspectos.

- Adecuada tipificación de las principales formaciones vegetales del bosque nativo.
- Estudios taxonómicos de sus principales especies
- Estudios de biología de la reproducción deficientes a nulos
- Ausencia de listas rojas establecidas sobre la base de los criterios de la UICN; existen especies declaradas como amenazadas o en vía de desaparición sin estudios científicos de respaldo en la mayoría de los casos
- Tareas de conservación *in situ* nulas
- Tareas de conservación *ex situ* deficientes
- Bancos activos de semillas limitados en su concepción y alcance
- Bancos de germoplasma deficientes en su concepción y alcance

A continuación, se presentan listados de especies nativas consideradas de interés para los principales tipos de formaciones vegetales del bosque nativo.

a) Monte ribereño

- *Salix humboldtiana, Cephalanthus glabratu*s, *Phyllanthus sellowianus, Sebastania klotzschiana, Pouteria salicifolia, Allophyllus edulis, Myrcianthes cisplatensis, Myrceugenia glaucescens, Blepharocalyx tweediei*

b) Monte serrano

- *Scutia buxifolia, Celtis spinosa, Fagara rhoifolia, Fagara hiemalis, Citharexylum montevideense, Myrcianthes cisplatensis, Lithrea brasiliensis, Heterothalamus alienus.*

c) Monte de parque

- *Prosopis nigra, Prosopis affinis, Geoffroea decorticans, Acacia caven, Parkinsonia aculeata, Trithrinax campestris, Aspidosperma quebrado-blanco*
d) Palmares
*Butia capitata, Butia yatay*

e) Monte de quebrada
*Lithrea molloloides, Blederocalyx tweediei, Aloysia gratissima, Schinus lentiscifolius, Rapanea ferruginea, Cupania vernalis, Sebastiania klotzschiana, Allophyllus edulis, Nectandra megatomica, Luehiae divaricata, Ocotea puberula*

**ii) Plantaciones**

Durante los últimos años ha habido una importante actividad en relación a plantaciones forestales, donde predominan especies de los géneros Pinus y Eucalyptus. Las especies más plantadas son *E. grandis, E. globulus ssp. globulus; E. globulus ssp. maidenii* que ocupan cerca de un 70% del área plantada, *Pinus elliottii* y *P. taeda*, que representan el 30% restante. Con estas especies se desarrollan programas de mejoramiento genético, tanto por instituciones del estado como por las empresas privadas. La micropropagación es una práctica corriente en especies de Eucalyptus y también existen antecedentes de embriogénesis somática y modificación genética.

Cabe destacar que en los últimos años se ha producido una considerable disminución en la tasa de forestación anual, en relación al quinquenio anterior. Entre 1996 y 2000, el promedio de forestación anual alcanzó a 67,578 ha., cifra que el 2001 se vio reducida a 38,716 ha. (Dirección General Forestal, 2003). Las principales especies plantadas son *Eucalyptus globulus*, con 16,500 ha. y *Pinus taeda*, con cerca de 15,000 ha. Otras especies plantadas son *E. grandis; E. saligna; E. maidenii; E. dunnii; E. nitens y E. viminalis*. En el caso de las coníferas también se planta *P. elliottii* y el híbrido *caribea x elliottii*

Como estudio de caso, se presenta el pool genético del Programa Nacional del INIA (Instituto Nacional de Investigación Agropecuaria) por considerarse que el trabajo de esta institución en mejoramiento genético en *Eucalyptus* y *Pinus* es uno de los más sistemáticos en el espacio y en el tiempo, realizado en el país. Está constituído por los siguientes componentes:

- Una red nacional ensayos
- Un banco activo de semillas
- Un banco clonal *in vitro*
- Dos bancos clonales en campo
- Un banco de conservación de germoplasma a largo plazo
- Una unidad de procesamiento y venta de semillas mejoradas

La red de ensayos consta de:

- 61 Pruebas de especies, procedencias y progenies de *Eucalyptus*
- 10 Pruebas de especies, procedencias y progenies de *Pinus*
- 4 Huertos semilleros de *Eucalyptus*
- 2 huertos semilleros de *Pinus*

El Banco Activo de Semillas consiste en:

- 32 especies de *Eucalyptus*
- 1794 accesiones de *Eucalyptus*
- 3 especies de *Pinus*
- 215 accesiones de *Pinus*
- 1 variedad mejorada de *E. grandis*
- 1 variedad mejorada de *E. globulus ssp. globulus*
4. Aspectos operacionales y organizacionales

4.1 Argentina

La Secretaría de Agricultura, Ganadería, Pesca y Alimentación (SAGPyA) ha creado los Núcleos de Extensión Forestal (NEF), con el fin de transferir tecnologías e información destinada a mejorar las técnicas de establecimiento de plantaciones forestales.

También ha establecido un programa de certificación de semillas forestales, para dar seguridad en el uso de semillas genéticamente mejoradas. Para esto se han establecido las Normas para la Certificación, Producción, Comercialización e Importación de Semillas de Especies Forestales. (Res. INASE 256/99)

4.2 Chile

Entre el 13 y 15 de Noviembre de 2002 se realizó en Chile la 12ª Conferencia de las Partes de CITES. Cabe destacar que Argentina propuso la inclusión de todas las poblaciones de Araucaria araucana en el Apéndice I. La propuesta fue aceptada parcialmente, ya que algunas poblaciones de la especie pasaron a formar parte de dicho apéndice.

En otros temas relacionados a los recursos genéticos forestales no hay grandes variaciones en relación a lo informado en la reunión anterior. Continúan los problemas relacionados al financiamiento de la investigación forestal, debida a que el sistema de asignación de recursos esta diseñado para investigaciones de corto plazo, lo que hace difícil hacer el seguimiento a investigaciones, cuyo financiamiento tiene plazos de 3 o máximo 4 años.

La Cooperativa de Mejoramiento Genético, en la que participan las principales empresas y organizaciones estatales del sector, publicó el primer catálogo sobre semilla mejorada, catálogo de árboles plus y valores genéticos de los huertos de Pinus radiata y Eucalyptus globulus ssp. globulus.

En estos dos años ha existido mayor financiamiento de investigaciones relacionadas con los recursos nativos y se ha dado comienzo a un programa de inventario y monitoreo continuo de los ecosistemas forestales nativos. Esto marca un importante avance en relación al cumplimiento de acuerdos internacionales, tales como el Convenio de Diversidad Biológica; el Proceso de Montreal y las propuestas de acción del proceso IPF/IFF.

En cuanto a la colaboración internacional, se destaca el proyecto destinado a promover el manejo de los bosques nativos, financiado por el banco alemán KfW, con la participación de GTZ y DED.

4.3 Paraguay

No hay antecedentes al respecto.

4.4 Uruguay

Las actividades de conservación y gestión de RGFs es prácticamente nula en especies nativas y comparativamente bien desarrolladas en especies introducidas de los géneros Eucalyptus y Pinus. En estos dos géneros, existe interés de participar en redes de trabajos regionales e internacionales.

A nivel privado, la ecocertificación de los bosques implantados podría ser una vía directa e indirecta de promoción de las actividades relacionadas a los RGFs. Varias empresas nacionales han ya logrado la certificación FSC.

A su vez, la ratificación de acuerdos internacionales como la CBD, el Proceso de Montreal, el Protocolo de Kioto y el Mecanismo de Desarrollo Limpio constituyen instancias legales donde se plantea directa e indirectamente la temática de los recursos genéticos forestales.
Sin embargo, las acciones previstas a nivel regional e internacional corren el riesgo de quedar sin efecto sin el fortalecimiento de las instituciones forestales (públicas y privadas) nacionales. La investigación forestal en el Uruguay necesita de un fortalecimiento de sus recursos humanos y financieros para permitir la planificación de los estudios relacionados a la gestión y conservación de los RGFs introducidos y nativos.

En Abril de 2003 se realizó la 14ª Reunión de los Grupos de Trabajo del Proceso de Montreal.

ANEXO : FUENTES DE INFORMACION

Argentina
Ing. José Luis Darraidu, Director, Secretaría de Agricultura, Ganadería, Pesca y Alimentación.; Ing. Cristina Resico.

Prof. Claudio Lopez, Universidad Santiago del Estero


Sr. Victor Cubillos, Gerente Forestal empresa Alto Paraná S.A.

Prof. Aníbal Verga, INTA, Córdoba

Chile

Instituto Forestal; Sr. Braulio Gutiérrez, Sra. María Paz Molina; Sra. Verónica Alvarez (Estadísticas).

Cooperativa de Mejoramiento Genético y Universidad Austral de Chile. Sr. Fernando Droppelman,

Paraguay
Servicio Forestal Nacional. Ing. Damiana Mann.


Uruguay
Sr. Atilio Ligrone, Director, Dirección General Forestal.

Dirección General Forestal Página web.


5 Se solicitó información de otras fuentes.
South America (except Colombia, Venezuela and Ecuador) list of species identified as high, global, regional and/or national priority.
Legend in Appendix 3

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<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
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5. REGIONAL UPDATE FOR WESTERN / NORTHERN / EASTERN EUROPE

by P.H. Ståhl

1. Policy and institutional issues

1.1 Institutions: new roles, responsibilities, capabilities, organizations

The European Forest Genetic Resources Programme (EUFORGEN) is fundamental for the forest genetic resources (FGR) work in Europe and this region.

EUFORGEN is a collaborative program among European countries aimed at ensuring the effective conservation and the sustainable use of forest genetic resources in Europe. It became operational in October 1994 and is financed by the participating countries and is coordinated by IPGRI, in collaboration with the Forestry Department of FAO. Its basic principle is that all activities within the program are carried out by institutions of the participating countries as contributions in kind to EUFORGEN. The pooled resources are kept minimal, covering only overall coordination and the cost of meetings and publications.

The Steering Committee of EUFORGEN is composed of national coordinators. At its 1998 meeting in Vienna a second phase was endorsed for the period 1 January 2000 – 31 December 2004. In March 2003, 31 countries were participating in EUFORGENE activities. Of particular interest in the new phase is that the former *Picea abies* network has been widened to a general Conifer network.

EUFORGEN operates through networks of forest geneticists and other forestry specialists analysing needs, exchanging experiences and developing conservation methods for selected species. The networks also contribute to the development of conservation strategies. EUFORGEN today has 5 conservation networks:

- Conifers
- Mediterranean oaks
- *Populus nigra*
- Noble hardwoods
- Temperate oaks and beech

The networks have accomplished a lot during the years. Of special value are the long term conservation strategies developed in the Noble hardwoods cooperative for Alder (*Alnus spp.*), Ash (*Fraxinus spp.*), Chestnut (*Castanea spp.*), Elm (*Ulmus spp.*), Lime (*Tilia spp.*), Mountain ash (*Sorbus spp.*), Norway maple and Sycamore (*Acer spp.*), Walnut (*Juglans spp.*), and wild fruit trees. Several of these species occur on the list of important species for conservation, improvement or seed procurement for northern, central and eastern Europe.

Network meetings are held regularly, on the average once per year. Excellent reports are produced from many of the meetings. EUFORGEN has a homepage [http://www.ipgri.cgiar.org/system/page.asp?frame=networks/euforgen/euf_home.htm](http://www.ipgri.cgiar.org/system/page.asp?frame=networks/euforgen/euf_home.htm) with valuable information about ongoing activities, country reports, etc. This homepage, in addition to the overall IPGRI homepage, should be visited regularly by anyone interested in forest tree gene resources.

In addition to the European cooperation within EUFORGEN there is also regional cooperation. One example is the Nordic Council for Forest Reproductive Material, a permanent unit under the Nordic Council of Ministers working for the coordination of management of forest genetic resources. Among its tasks are:

- To initiate and develop Nordic cooperation on practical and administrative issues
- To collect and distribute information
- To assist in education (conferences, etc.)
- To follow and initiate research and development
- To work for a common Nordic conduct at international meetings, conferences, etc.
During recent years the NSFP has e.g. been actively leading a discussion on the management of Nordic FGR. Of particular value is a recent report “Tree Gene Resource management in the Nordic Countries- a review of the situation in 2002”. The chairman has been provided with some copies of this publication. It gives an overview of the national activities and legislation and supports the ongoing planning of Nordic cooperation on forest tree gene resource management.

For information on national institutions, please see to the EUFORGEN homepage.

1.2 New legislation, policies, strategies on forest genetic resources

When as many countries as in this region are involved, legislative changes occur continuously. The changed EU regulations on trade with seed and seedlings for instance led to revised or changed legislations in many of the EU member countries. They also affected non-member states in that they set new rules for the trade with seed, seedlings, etc. The author is, however, not aware of any more dramatic changes in legislation affecting FGR since the last meeting of the Panel.

Among the 5 Nordic countries discussions about the management of FGR, for instance the creation of a Nordic Forestry Gene Bank, coordination with EUFORGEN, etc. is going on in a process started by the Council of Ministers and the NSFP. There is a positive attitude towards increased cooperation and coordination of FGR work within the NSFP framework. Basic conditions for this are a better knowledge about the conditions etc. within the different countries and sufficient funding. The work and discussions continue.

Forest certification becomes more and more widespread in Europe. Within the region discussed in this report two systems dominate, the Forest Stewardship Council’s (FSC), [www.fscoax.org](http://www.fscoax.org) and the Pan-European Forest Certification (PEFC), [www.pefc.org](http://www.pefc.org). The two systems are relatively similar, but do not recognise each other. The exact rules, please see the homepages, set by the certification systems vary from country to country, but in general definite rules are set by the certification systems for how the forest owner/manager should take care of his forests. Both systems provide benefits from the point of view of FGR management.

1.3 Developments in forest management/ownership

There is no clear overall tendency in the region for how forest management is developing. In Germany and some central European countries there is a strong move away from even-aged monoculture plantation forestry towards uneven-aged mixed species forestry. This has led to reductions of several tree improvement programs. Without a significant amount of plantation forestry there is little to motivate the costs for tree improvement.

The situation is different in northern Europe, particularly in Finland and Sweden, where even-aged plantation forestry, with larger and larger shares of genetically improved plantation materials, dominate. In Sweden, just to take an example, artificial reforestation is used on approximately two thirds of the regeneration area. Tree improvement and forest genetic studies are relatively well financed in these countries.

Today there is an increased interest in using indigenous materials and a reduced interest in exotics in many of the countries. But, in e.g. Ireland and Scotland the forestry to a large extent is based on plantations of exotic species.

Forest ownership trends are highly variable in the region. In the Baltic republics, for instance, there is a privatisation process of forestland going on, a return to the conditions that existed before the 2nd World War. In Sweden, on the other hand, most of the State forests have been privatised.

Certain forest industry companies in the region are also, mainly to improve the return of the capital they are set to manage, talking about the possibility of divesting themselves from the forest lands.
This could open up an interesting situation where the traditional almost exclusive use of wood for purposes such as pulpwood and saw timber, can become much more open, with e.g. chemical industries starting to look for wood as an interesting new raw material.

Another trend is that large national forest industry companies are merging with companies from other countries, i.e. becoming multinational. One result of this is an increased pressure for cooperative research, potentially also FGR research, between institutions in the different companies.

**1.4 Links with other international actions, frameworks or agreements (national forestry programmes, Convention on Biological Diversity; Agenda 21 of UNCED, notable work of the UN Forum on Forests; etc...)**

Since the Panel’s last meeting a lot of work has been accomplished, based on the Convention on Biological Diversity. Forests and FGR have become more discussed and actions been taken on both regional and national levels.

There seems to be an increased interest in a common European forest policy within the EU. So far major forest countries like Sweden and Finland seem to be opposed to this idea.

While the EU still has no common forest policy a Forest Strategy for the European Union was agreed upon in 1998. It is based on the forest principles from UNCED 1992 and the work carried out in the Pan-European Process on the Protection of Forests and other international agreements. Forest issues are also presented in the Biodiversity Action Plan for Agriculture Biodiversity and the Action plan for the Conservation of Natural Resources. Among points emphasized by the European Parliaments in its comments to the strategy was the importance of protecting remaining virgin and natural forests.

The EU LIFE-fund finances a number of biodiversity research projects in the member countries.

All the work with the CBD and EU initiatives has led to many new national activities, legislation, studies and other R&D activities.

**2. Technical and biological issues**

**2.1 New FGR assessments, exploration, conservation programmes**

In many countries within the region various kinds of FGR studies have by now been carried out for at least 40–50 years. Very large numbers of genetic tests of varying types and ages exist in the region. Just as an example, the Forestry Research Institute of Sweden, has some 1500 active field tests and trials of genetic materials. Results are continuously coming from these studies and other ongoing research and form the base for better and better genetic materials and recommendations for their use.

The tests are mainly carried out for major indigenous species with a large industrial use, like *Pinus sylvestris*, *Picea abies*, *Betula spp.*, etc. Much work is, however, also done on major exotic species like *Pinus contorta*, *Picea sitchensis*, *Pseudotsuga menziesii*, etc. Throughout the region research on conifers dominates very clearly. Research on geographic variation through provenance trials is becoming less and less predominant and the centre of gravity for forest genetic research is now definitely plus tree selection, breeding and progeny testing. Seed orchard materials now exist, in several countries of the region, which is 25% superior in growth to stand seed.

After saying that it must also be said that even in regions, where evaluation of FGR has been going on for at least 50 years, like the Nordic countries, there are still interesting new materials to be evaluated. New Scots pine (*P. sylvestris*) sources from the Komi republic in north-central Russia are being tested in northern Sweden. The materials seem to be more cold hardy than Fennoscandian sources from similar latitudes.
Another example is a study set up to see how *Picea abies* seed originating in east-Europe but grown one generation in southern Sweden compare to directly imported seed of provenances and Byelorussian as well as Swedish orchard seed. The study should give information about a possible land race formation and hopefully also give indications of what could be suitable reforestation materials to complement a short supply of Swedish orchard seed.

**2.2 Research on new forest products (entailing sustainable resources)**

While there certainly is a lot of research on new forest products going on, it is hard to find examples that have a significant effect on our genetic resources.

One possible example would be the interest in Finland in using aspen (*Populus tremula*) for making paper. Aspen based paper is quite light and has some other interesting properties. The aspen resources in Finland are limited and for this reason there is an interest in growing hybrid aspen (*P. tremula x tremuloides*) again. This fast-growing hybrid was one of the earlier tested in northern Europe, already in the early 1950’s, but has been of very limited interest for almost 50 years. It was originally intended as a raw material for the match industry but when the demand for matches went down, so did the interest in the hybrid. A small Swedish research project had followed hybrid aspen trials, and when the interest now came up again it was able to provide research data and genetic materials of interest to the Finnish industry. Hybrid aspen plantations for pulp wood production are now being established in both Finland and Estonia.

**2.3 Activities in germplasm supply, demand, procurement and exchange)**

EUFORGEN has had a very positive effect in these fields, through its networking model of working. The frequent opportunities for researchers and other forestry specialists to work together give numerous opportunities to discuss and arrange exchange of genetic material, especially for research. As tree improvement activities have been going on for quite some time in many of the countries of the region, improved seed is now available, and in great demand. In Sweden, for example, it has been estimated that 80% percent of all Scots pine (*Pinus sylvestris*) seedlings are produced from improved seed by now. Improved seed in commercial quantities can also be found on international markets. Orchard seed of Norway spruce (*Picea abies*) have for instance been imported to Sweden from Byelorussia.

Just a couple of examples of ongoing exchange activities should be enough to demonstrate what is going on in this field and what the effects could be:

- With partly Nordic funding seed from 980 individual Siberian (*Larix spp.*) larch trees, from 15 regions and 49 stands from Kamtchatka in the east to the river Onega in the west, have been collected. Family tests and provenance studies with this material are being planted in a joint study by mainly Norway, Sweden and Russia, but with involvement of Kyushu University in Japan and the University of Minnesota as well. The genetic trials form part of a major research cooperation in the Barents region (Norway, Sweden Finland and NW Russia. In addition the forest genetics research, seed production, forest regeneration, forest production and wood science studies are included in the overall project which aims at the development of the forestry sector of the region.

- A joint Lithuanian-Swedish study of Alder (*Alnus glutinosa*) is underway. It aims to provide information about the geographic variation of the species and recommendations for suitable reforestation materials for the region.

A Nordic approach to access and rights to genetic resources is being developed within the Nordic Genetic Resources Council. In a draft report from March 2003, it is concluded that “forest genetic resources should be kept available as freely as possible” and recommended that “the Nordic countries consider changes in their relevant regulations to assure this for the future”.

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2.4 Developments in tree selection, and improvement, field evaluation

Various forms of tree improvement are actively being pursued in almost all countries of the region. In most the activities have by now been going on for many years, 50 or more in several cases. For example, in the Nordic countries, Ireland, Scotland and the Baltic republics plantation forestry dominates the forests, and here the interest in tree improvement is high. The effects of the tree improvement activities have been substantial. Falling back on a Swedish example, orchards being established today, still using first generation selection, will produce seeds, which are around 25% superior to the seed that can be collected from the native trees. – It should not come as a surprise to anyone that the demand for improved seed is increasing wherever it can be shown to be significantly better than other seed sources. Orchard seed is the basis for a large and growing share of all seedlings being planted in the countries mentioned.

The picture in Germany and some other central European countries is different. Here, as mentioned before, forest managers have become more and more interested in uneven-aged forestry, often using mixed species stands and more and more natural regeneration. In these countries, the interest in tree improvement is of course limited and tree improvement activities have been significantly reduced.

2.5 Threats to FGR, protection and conservation

The major long term threat to our FGR must be the global warming and general climate change. In our region seedlings planted today will be growing in the forests for as many as 50–100 years. During that period the climate according to most scenarios is expected to change significantly, with a warming of 2-3°C during the coming 100 years. If this is realized, the range limits of tree species in our part of the world will move northward/upwards. Not only is the climate expected to warm up, for much of northern Europe rainfall is also expected to increase.

The climate change many feel that we have seen in the last few years is no immediate threat to the forests of the Nordic countries. The trees are plastic enough to be able to grow under varying conditions. If, on the other hand, the climatic change becomes large and sustained the trees will have to adapt genetically. Because of the significant genetic variation existing in most tree species, most species should be able to adapt over a longer time period, if the change in climate is not too rapid. Tree breeders can speed up the change in the different species. By testing the trees under various climatic conditions they will have knowledge about which trees to use as parents under coming climatic conditions. For this reason the risk for species of economic importance and used in plantation forestry will probably be less than it will be for minor species regenerating naturally.

The air pollution problem has been reduced in much of the region during the last ten or so years. The sulphur deposition has gone down, thanks to changed heating sources, better exhaust controls etc. No real improvement has been seen in, for instance, the nitrous oxide emissions or the gasses causing global warming like CO₂ or HFCs.

The damage to forest trees, especially firs and spruces in northern and central Europe seems to have been reduced during the last few years, probably as a response to less acid rain caused by the reduction in sulphur dioxide.

Elm disease continues to spread and intensify.

In the 2001 report to the panel, was reported that in Sweden large areas of middle-aged pine forest had been severely attacked by the fungus *Gremmeniella abietina*, a species which can attack both Scots pine and Norway spruce. At least 300 000 hectares were more or less severely damaged and large areas had to be clear cut and replanted. The situation now seems to be normal again. One hypothesis about the cause of the disease outbreak is a combination of summers with a high rainfall/humidity and mild winters, something that fits well with the predicted climate change in Sweden.
Studies of the disease carried out in long term provenance trials since the damage was first detected show that pine of southern origin suffered greater damage from the disease than pine of local or northern origin. Several genetic tests showed significant differences in damage among trees. Fast growing types do not have greater damage than slower-growing trees. This indicates that it will be possible to select for trees that combine both high production and good resistance.

2.6 Advances in biotechnologies, including genetic modification

Biotechnology research has increased substantially during the last few years and at least locally at the cost of traditional genetic research. Within forest biotechnology research it appears as if micropropagation (particularly somatic embryogenesis) and various forms of gene technology dominate.

Much of the gene technology research has been around wood properties such as lignin modification, control of flowering and resistance. Promising results have been reached but so far very little integration with traditional breeding and tree improvement has occurred. Little if any field testing has taken place and it will be in all probability a very long wait before genetically modified trees are seen in our forests. One can in fact discuss whether there will be a great future for gene technology among long-living tree species.

The economy of gene technology to a large extent depends on the use of patents which can finance the activities. Patent rights normally are 20 years, and it will be very difficult to evaluate the effects of gene modification within this time, if the time required for propagation and field testing is included.

For instance Finnish and Swedish forest industry is still very hesitant or negative to gene technology in the form of gene modification and has not supported such research financially. The main reason is certainly the negative view shown by their customers and forest certification organizations.

3. Operational and organizational issues

- New development in training, education, extension, and
- Information management and dissemination of information.

Training, education and other forms of exchange of information are of utmost importance for the future of FRG research. It is encouraging to see that good education in forest genetics is available in most countries in the region. A substantial amount of exchange among the countries also takes places with graduate students getting advanced degrees at schools and universities in countries other than their own. Numerous researchers from the countries of the region are also, or have been, working as visiting researchers or “post docs” at various institutions both within and outside of the region.

In Sweden, research foundations, the University of Agricultural Sciences and the Forestry Research Institute have pooled resources to finance a research school in forest genetics. It will during 5 years train 11 graduate students to the Ph.D. level in quantitative and molecular genetics.

The Internet is becoming a very important tool for FGR researchers providing information “on demand”. The amount of information in our area is increasing very rapidly. E-mail has also become a dominant form of communication among researchers, facilitating and speeding of our research considerably.

Computer based interactive knowledge systems are also being introduced as management and education tools. One example can be the tool developed in Sweden to help foresters choose the best possible reforestation materials. The forester provides a number of descriptive data about a site he wishes to plant and the computer based system helps him pick the best possible plantation materials among improved sources and various sources of stand seed.
Notes related to financial scenarios, sources of funding

The financial situation for research in general, and in forest genetics in particular, has deteriorated during the last two years. The major reason is probably that many research funds have lost considerable amounts of their resources as a result of the drop on our stock exchanges.

In several of the countries of the region traditional forest genetics and tree improvement research is still meeting very strong competition for research funds, particularly from biotechnology research. It should be emphasized, however, that also biotechnology research is now under financial stress as a result of the problems caused by the drop of the stock exchanges.

EU financing was of great importance within the region during the EU 5th framework program (1999–2002). Forestry and genetics were quite successful in competing for the considerable research funds provided by the Union. In the present 6th Framework programme our aspects of research have met with large problems. Not a single Integrated Project or Network of Excellence has been financed so far within the fields of forestry or traditional tree improvement.

Development of regional and international cooperation

Cooperation in the region and internationally is frequent, with the EU as a key source of financing. With the new member states in the Union the cooperation can be expected to increase. Much interaction is also taking place through for instance IUFRO, and regional organizations, e.g. the Nordic Council.
North and Central Europe list of species identified as high, global, regional and/or national priority.
Legend in Appendix 3

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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6. REGIONAL UPDATE FOR THE MEDITERRANEAN

par M. Bariteau

Ce texte actualise le rapport réalisé en 2001 à l’occasion de la 12\textsuperscript{ème} session du groupe FAO d’experts pour les ressources génétiques forestières (Rome, 21-23 novembre 2001). Peu d’éléments ont été communiqués par les correspondants institutionnels des différents pays contactés, ce qui traduit vraisemblablement une faible évolution depuis 2 ans de la situation dans le domaine des ressources génétiques forestières en Méditerranée (voir annexes 2 à 4). Les forêts méditerranéennes font en moyenne l’objet de peu de reboisements relativement à d’autres régions du monde et les activités liées à l’utilisation des ressources génétiques sont de faible niveau. En matière de conservation des ressources, il est toujours aussi difficile d’établir un bilan non seulement en raison de la diversité des contextes biologiques, géographiques, politiques et sociaux, mais également parce que les statuts variés de protection affichés par les États cachent des situations réelles très différentes d’une région à l’autre. La stabilité politique et le développement économique restent dans bien des cas les meilleures garanties contre l’érosion de la diversité des forêts et ils sont finalement de bons indicateurs de l’état des forêts : les surfaces forestières régissent chaque fois que la situation sociale se dégrade, quelque soit le statut de protection imaginé. Par exemple l’instauration d’une certaine stabilité en Algérie favorise le retour des forestiers dans les massifs et l’arrêt des coupes en délit qui menaçaient certains peuplements remarquables de Cèdre de l’Atlas (Malika Illoul – communication personnelle).

En matière de politique, les avancées sont à mettre au bénéfice des conventions et accords internationaux relatifs aux forêts. Ce rapport fera le point sur quelques éléments nouveaux concernant l’Europe et les conséquences sur les pays méditerranéens (Conférence ministérielle sur la protection des forêts en Europe; Natura2000 ; Centres de Ressources Biologiques).

Un état sera présenté sur l’évolution des réseaux : leur fonctionnement est essentiel pour une prise en compte globale de la conservation des ressources génétiques forestières à l’échelle du bassin méditerranéen (EUFORGEN, Silva Mediterranea).


1. Conventions Internationales – conséquences pour la Méditerranée


Cela renforce le poids nécessaire des grands engagements internationaux ou de certaines directives européennes telles que celle qui a donné naissance au réseau Natura2000. Ce réseau a pour objectif de contribuer à préserver la diversité biologique sur le territoire de l'Union Européenne. Il assurera le maintien ou le rétablissement dans un état de conservation favorable des habitats naturels et des habitats d'espèces de la flore et de la faune sauvage d'intérêt communautaire. On trouvera en annexe 1, un état des lieux des sites proposés par les pays euroméditerranéens, qui montre la montée en puissance de ce réseau entre 2000 et 2003.

L’Organisation de Coopération et de Développement Économique (OCDE) a lancé en mai 1999 une réflexion sur les « centres de ressources biologiques », couvrant le matériel biologique microbien, humain, végétal et animal.

Le groupe de travail chargé de cette réflexion vise essentiellement trois objectifs :
- la mise en place d’un système d’accréditation de collections de référence, (alors qualifiées de “ centres de ressources biologiques ”) sur la base de leurs fonctions, leur qualité et leur expertise ;
- leur mise en réseau dans le cadre d’un système mondial pour une libre circulation du matériel biologique ;
- un soutien public et une possibilité de valoriser commercialement ces collections.


2. Les réseaux

Deux réseaux ont des activités significatives dans le domaine des ressources génétiques forestières en zone méditerranéenne : EUFORGEN et Silva Mediterranea.


Le Comité des questions forestières méditerranéennes *Silva Mediterranea* est un organe statutaire de la FAO dont les organes directeurs sont la Commission européenne des forêts (CEF), la Commission des forêts pour le Proche-Orient (CFPO) et la Commission des forêts et de la faune sauvage pour l'Afrique (CFA). Des travaux importants ont été entrepris jusqu’à un passé récent dans le cadre de différents réseaux *Silva Mediterranea*, en particulier dans le domaine des ressources génétiques des conifères. La XVIIIème session, qui s’est tenue du 2 au 5 avril 2002 à Rome, a été l’occasion de définir de nouvelles orientations pour *Silva Mediterranea*. En particulier, à quelques exceptions près, les réseaux verront leurs activités s’arrêter. Dans ce cadre, et sur la base d’une proposition de la France, le Comité a recommandé d’évaluer les travaux entrepris dans le programme antérieur sur les essais de provenances de conifères méditerranéens avant sa fermeture. Ce travail débutera en 2004 et se concretisera, entre autres, par la production d’une base de données relationnelles disponibles sur le Web. Les pays ont accepté d’y participer et ils apporteront un soutien en collectant les données nécessaires au niveau national.
3. Les événements biologiques et climatiques

Les deux années passées ont vu la multiplication d'événements climatiques extrêmes : inondations, sécheresses, ouragans, gelées exceptionnelles. Par ailleurs (en lien avec ces aléas climatiques ?) des dépérissements et des attaques de ravageurs sont signalés dans un certains nombres de massifs : cèdres en Algérie, au Liban, en Turquie, pin d’Alep dans le sud-est de la France, chênaies …

Il est cependant impossible d’établir un bilan sur l’érosion réelle de la diversité génétique à partir de ces constatations, voire de son évolution sous la pression de nouveaux facteurs de sélection. Il serait intéressant d’installer un observatoire méditerranéen de la diversité génétique sur quelques peuplements ou espèces-modèles de façon à évaluer l’impact éventuel des changements climatiques à long terme. Les suivis pourraient se faire à l’aide d’indicateurs moléculaires et démographiques.


4. La recherche

Durant ces dernières années, il y a eu en Europe de nombreuses activités de recherche sur la diversité génétique des forêts, pour la plupart soutenues par la Commission européenne. Les pays méditerranéens ont été largement associés à ces projets, non seulement parce qu’ils hébergent des équipes de recherches actives dans le domaine de la génétique forestière mais également parce que les zones méditerranéennes sont d’anciens refuges glaciaires et que les populations forestières sont des réservoirs importants de diversité.


En ce qui concerne le rôle des forêts méditerranéennes comme réservoir de diversité (refuges glaciaires), un article récent de Science apporte des éléments nouveaux et surprenants, issus des travaux menés dans le cadre du projet européen CYTOFOR (PETIT R. et al, 20033). Les peuplements feuillus testés (sur la base de la diversité de l’ADN chloroplastique) ont une diversité intra-population nettement supérieure aux latitudes intermédiaires, par comparaison avec les peuplements méditerranéens (22 espèces échantillonnées). Par contre ces derniers montrent de fortes divergences entre populations, en particulier pour les espèces à faible capacité de dispersion des graines. Cette publication montre que si les forêts méditerranéennes sont des « hot spots » de diversité, cela tient plus à la diversité observée entre populations (et à leur caractère « unique »), qu’au sein des populations. Il faut donc avoir une approche globale des espèces au niveau des aires naturelles pour établir des priorités et des règles cohérentes de conservation.

Un autre projet européen DynaBeech, « Effects of silvicultural regimes on dynamics of genetic and ecological variability of European beech forests. Impact assessment and recommendations for sustainable forestry », a associé, entre autres, deux équipes italiennes et une équipe française.

Des parcelles en hêtraie ont été installées pour amorcer le suivi génétique à long terme de l'évolution sous pression anthropique (la gestion) ou naturelle (dans les parcelles non gérées) de la structure génétique des populations étudiées.

Des premiers résultats ont été obtenus en France (E. Teissier du Cros – communication personnelle) :
- La non gestion, qui entraîne une régénération par petites trouées, conduit à des cercles de consanguinité.
- La recolonisation par des essences climaciques (hêtres, sapins, feuillus divers...) des peuplements d’origine artificielle constitués pour la restauration des terrains en montagne et la régulation des cours d'eau, est une généralité dans le sud de l'Europe. La constitution génétique des nouveaux peuplements issus de cette recolonisation dépend du nombre de semenciers et de leur répartition.
- Pour le sapin pectiné, une très faible densité de semenciers entraîne une forte consanguinité. Pour le hêtre, le niveau de diversité génétique est suffisamment élevé car le nombre de semenciers pré-existants est en général satisfaisant. Par contre on constate une forte structuration due au transport secondaire des graines par des petits mammifères ou des oiseaux qui constituent des caches. Cela conduit à des groupes d'arbres apparentés.

Ces deux exemples, pris parmi beaucoup d'autres, montrent l'avancée des connaissances sur la diversité génétique des forêts méditerranéennes à des échelles très différentes : au niveau des aires naturelles et sur la base de 22 espèces européennes et méditerranéennes dans le premier cas, au niveau d'individus dans le second cas avec une méthodologie innovante croisant observations démographiques et analyses génétiques.

Très peu de publications font état de résultats dans les domaines de la diversité adaptative testée en condition de plantations comparatives. Cette méthode considérée comme scientifiquement dépassée est pourtant la seule capable d'évaluer la diversité génétique adaptative en condition réelle d'utilisation des ressources forestières, et donc finalement de les « domestiquer ». De plus, les informations issues de ces essais constituent une base d’information précieuse pour les activités de conservation. Elles sont de plus en plus souvent publiées sous forme de « littérature grise » peu accessible.

5. Conclusion

Ce rapport n’apporte pas d’éléments originaux pour la période des deux années écoulées. Le constat est que les engagements internationaux progressent dans le bon sens mais qu’il manque encore de véritables programmes nationaux concrets pour inverser une situation jugée alarmante en Méditerranée, en particulier dans le sud du bassin. Dans un contexte avéré de changement climatique rapide, les forêts méditerranéennes constituent un réservoir de diversité génétique irremplaçable.

La conclusion est donc similaire à celle du rapport 2001 : l’accentuation de la sécheresse, vraisemblablement liée au changement climatique, conjuguée avec d’autres facteurs d’origine anthropique, crée une situation d’urgence pour la conservation des forêts du bassin méditerranéen, plus particulièrement au Sud et à l’Est. La faible prise de conscience de l’ampleur de ce phénomène par la communauté internationale est frappante, alors même que les conséquences écologiques et sociales du recul de cette forêt sont majeures. Il est proposé qu’une recommandation soit émise par le groupe d’experts pour qu’une priorité très forte soit donnée dans les années à venir à des actions ciblées et coordonnées de conservation des ressources génétiques forestières méditerranéennes.
### Liste des espèces prioritaires

<table>
<thead>
<tr>
<th>Espèces</th>
<th>Utilisations finales</th>
<th>OPERATIONS / ACTIVITES</th>
<th>REMARQUES</th>
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</tr>
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<td>3</td>
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<td>Abies pinsapo</td>
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</tr>
<tr>
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<td>X</td>
<td>X</td>
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<td>X</td>
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<td>X</td>
<td></td>
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<td>X</td>
<td></td>
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<td>Pinus brutia</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pinus halepensis</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinus nigra spp.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinus pinaster</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Populus nigra</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Quercus sp.</td>
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<td>X</td>
<td></td>
</tr>
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<td>Taxus baccata</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tetraclinis articulata</td>
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</tbody>
</table>

---

**Liste des espèces prioritaires**

**Operations / Activités**

- Prospection & récolte
- Evaluation
- Conservation
- Utilisation du matériel génétique

**Remarques**

- PVT, PGT EUFORGEN
- PVT, (E) Protected areas in Spain EUFORGEN
- CLT en Italie Dépérissement (Endotia parasitica)
- PVT, PGT, Silva mediterranea Conservation prioritaire en Algérie (Aurès)
- PVT : Silva mediterranea (E) Conservation prioritaire au Liban
- Réseau Silva mediterranea MPTS
- Forte régression au Maroc et en Algérie Régénération difficile MPTS, EUFORGEN
- Récolte de la résine : parfumerie
- EUFORGEN
- PVT, PGT, SO ; Tests FAO Résultats récents (projets européens) ; 49 peuplements conservatoires en Turquie EUFORGEN
- PVT, PGT Tests FAO Résultats récents (projets européens) ; EUFORGEN
- IUFRO EUFORGEN
- PVT Peup. de petite taille en Espagne EUFORGEN
- EUFORGEN
- EUFORGEN
- EUFORGEN
- EUFORGEN
Annexe 1

Baromètre Natura2000 – Evolution entre août 2000 et juillet 2003 (pays méditerranéens)

<table>
<thead>
<tr>
<th>Etat membre</th>
<th>Nombre de sites proposés</th>
<th>Superficie totale correspondante (km²)</th>
<th>% du territoire national concerné</th>
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<tr>
<td>Grèce</td>
<td>234</td>
<td>236</td>
<td>26 522</td>
</tr>
<tr>
<td>Espagne</td>
<td>867</td>
<td>1 276</td>
<td>88 076</td>
</tr>
<tr>
<td>France</td>
<td>1 028</td>
<td>1 174</td>
<td>31 440</td>
</tr>
<tr>
<td>Italie</td>
<td>2 507</td>
<td>2 369</td>
<td>49 364</td>
</tr>
<tr>
<td>Portugal</td>
<td>65</td>
<td>94</td>
<td>12 150</td>
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</table>
Annexe 2

Conservation des ressources génétiques forestières en Turquie
(Par Dr. Hikmet Ozturk, Directeur adjoint – Direction des recherches sur les semences forestières et l’amélioration génétique des arbres forestiers
ANKARA/TURKEY)

Le service forestier en Turquie mène un programme d’amélioration pour Pinus brutia : 11 tests de descendances open ont été établis dans lesquels plus de 1200 familles sont testées sur un total de 77.7 ha.

Les vergers à graines produisent assez de graines pour le reboisement pour les espèces suivantes : Pinus brutia, Pinus nigra and Pinus sylvestris. Pour ces espèces les peuplements porte-graines ne sont plus nécessaires. De par leur caractère naturel, ces peuplements répondent bien aux besoins de la conservation des ressources génétiques. Le programme de conservation des ressources génétiques repose sur un système de populations multiples : les populations sont échantillonnées dans différentes régions géographiques, dans des conditions écologiques variées et avec une attention particulière pour les populations marginales.

La Turquie participe depuis plus de 3 ans aux réseaux EUFORGEN conifères, feuillus sociaux, feuillus précieux, chênes méditerranéens.

### Peuplements porte-graines sélectionnés

<table>
<thead>
<tr>
<th>Espèces</th>
<th>Nombre de peuplements</th>
<th>Surface totale (ha)</th>
<th>Surface du noyau (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinus nigra</td>
<td>79</td>
<td>10 329,30</td>
<td>4 101,75</td>
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<td>1</td>
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</tr>
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<td>11 762,00</td>
<td>4 304,00</td>
</tr>
<tr>
<td>Pinus sylvestris</td>
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<td>4 813,00</td>
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<tr>
<td>Cedrus libani</td>
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<tr>
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<tr>
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<td>12</td>
<td>2 158,00</td>
<td>986,00</td>
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<tr>
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<td>10</td>
<td>2 149,00</td>
<td>573,00</td>
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<td>555,60</td>
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<tr>
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<tr>
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<tr>
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<td>1 859,30</td>
</tr>
<tr>
<td>Quercus spp</td>
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<td>903,66</td>
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<tr>
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<tr>
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<td>Tilia spp.</td>
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### Forêts conservatoires de ressources génétiques

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<th>Surface totale (ha)</th>
<th>Surface du noyau (ha)</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>Cedrus libani</td>
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### Vergers à graines de clones

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<td>Pinus pinea</td>
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<td>Cedrus libani</td>
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</tr>
<tr>
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<td>2,2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>163</td>
<td>1123</td>
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</tbody>
</table>
Annexe 3

(Information communiquée par Abdelahmid Khaldi – INRGREF Tunis/ Tunisie)

Travaux de recherche 2002-2003 liés à la conservation et à la valorisation des ressources phyto-génétiques dans le domaine forestier :

- Sauvegarde, conservation et développement de la culture du câprier (*Capparis spinosa*) :
  - Étude de la variabilité morphologique (avec des applications pratiques pour le développement de la culture de cette espèce).
  - Une unité de production des plants de câprier par multiplication *in vitro* a été mise en place.
  - Installation d'une collection de germplasme contenant 22 écotypes provenant de toutes les régions à câprier en Tunisie.
  - Une thèse sur ce sujet est en cours pour étudier les comportements de ces écotypes dans différentes conditions.

- Conservation et valorisation d'une espèce en voie de disparition: le laurier noble (*Laurus nobilis*) :
  - Étude de la variabilité morphologique
  - Essai de multiplication *in vitro* (DEA)
  - Étude de la résistance à la salinité (DEA)
  - Repérage et essai de repeuplement dans les très rares sites naturels.

- Conservation et valorisation du caroubier (*Ceratonia siliqua*) :
  - étude de la variabilité morphologique (gousses).
  - essais d'extraction de la gomme de caroube (en collaboration avec le CWBI-Belgique).
  - essai de greffage en pépinière.
  - enquêtes socio-économiques sur les usages et la conservation de cette ressource.

Annexe 4

(Information communiquée par Gabriel Schiller – The Volcani Center, Bet Dagan/Israël)

Travaux de recherche liés à la conservation du Pin d’Alep « natif »

1) Pas de nouveautés en matière de politique de conservation des ressources génétiques forestières
2) Il y a une menace sur les pins d’Alep natifs en raison de l’introduction d’origines exogènes et d’hybridation avec le Pin brutia introduit (SCHILLER et al, 1997)
3) Des recherches vont être menées pour caractériser à l’aide de marqueurs moléculaires les vieux pins d’Alep (170 à 200 ans) présents avant le reboisement de la Palestine de façon à mettre en place des opérations de sélection et de conservation *in situ* et *ex situ* du pin d’Alep originel.

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7. REGIONAL UPDATE FOR SOUTH AND EAST ASIA

by D. Baskaran K

1. Introduction

Since the last reporting in 2001, situations in FGR within the Southeast Asia countries have not changed much. However in recent years countries rich in biodiversity like Malaysia, Thailand, Vietnam, Laos and Cambodia have shown a keener interest in exploiting their forest resources for medicinal plant research and drug discovery programs by linking with research institutions and big pharmaceutical companies from the developed countries. Issues on protection and rights to the germplasm, IPR and MTA etc are now becoming critical issues that need to be addressed. While in countries like Malaysia where there is a definite policy on the use of biological diversity these are still lacking in some of the other developing countries participating in such activities.

This review below gives an overall update of activities from 2002-2003 in the countries covered in the region, which includes Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam.

2. Regional status report by countries

2.1 Brunei

- Activities ongoing as those reported in 2001.
- No changes in conservation status.
- However, over the last two years or so, serious efforts are being made to rehabilitate those areas that have been affected by minor forest fires.

2.2 Cambodia

All activities report in the 2001 report still applies. In addition, the following are updates as obtained over 2002-2003.

In 2003, Department of Forestry and Wildlife (DFW) have plans for the planting of 1,625 hectares through its planting stations focusing on *Eucalyptus camandulensis*, *Tectona grandis*, and *Dipterocarp spp*. A total of 1.3 million seedlings will be produced for distribution to the local population, consisting of a mix of exotics, natives and fruit.

Tree planting activities planned by the Armed Forces will cover 2,200 hectares each year. A prerequisite for successful tree planting is good quality seed, which requires conservation of forest genetic resources.

In early 2003, the Cambodian Tree Seed Project (CTSP) conducted a survey to estimate seed demand. The findings are presented in Table 1. The national annual seed demand will be higher. Among the 21 species used in planting programmes only three are exotic (acacia, eucalypt and teak) and the rest are indigenous. Currently, indigenous species form a small percentage of total seedling production, and are used mainly in small-scale plantations, Arbour Day, research sites, and pagodas. *Acacia spp* and *Eucalyptus spp* account for the largest share of seedling production, and play a significant role in large-scale plantations for rehabilitation of degraded forests or in the pulp and paper industry.

In Cambodia there are no enterprises or private companies dealing with tree seed supply. This is because the demand for seed is still low and it is not possible to estimate future demands because none of the users have long term plans for tree planting activities, thereby posing a major constraint to planning for the ongoing supply of good quality seeds of appropriate species, which is, by nature, a long-term process. Instead, tree seeds are obtained in a number of ways, like purchase from local people, self collection or purchase from established sources both locally or internationally.
In 2002, with financial assistance from the Japan International Cooperation Agency (JICA), DFW established a training centre. A number of courses have already been conducted on different subjects related to the field of forestry. However, at the moment there is no course related to forest genetic resource conservation.

Proposal for regional and international collaboration

As part of a regional programme, CTSP provides links for DFW into the Indochina Tree Seed Project, which promotes cooperation and information exchange between the tree seed sectors within Cambodia, Vietnam and Laos PDR.
Little information exists in Cambodia on bamboo and rattan resources, utilization and management, although they have a long tradition of use. There is a need to establish a network of bamboo and rattan research and management with cooperation from the Bamboo Information Centre (China, India) or with other international institutes dealing with bamboo and rattan.

**Policy and institution issues**

The forestry administration is undergoing reform to establish a direct organisational line of command from central to local levels by returning forest management responsibility to the relevant authorities. Such reforms require a comprehensive review of the roles and responsibilities of all levels of DFW, lines of communication, and interactions with other government departments to ensure effective ground level implementation.

The Royal Government of Cambodia (RGC) acknowledges international issues, processes and commitments during and following UNCED in 1992. Therefore, consistent with IPF/IFF guidelines, a national forest programme will be developed as a process for forest policy implementation and strategy development. Currently in its initial stages, activities to date have consisted of capacity building meetings to familiarise DFW staff and advisors with the elements and structures of the national forest programme.

A statement on national forest policy was issued by RGC in 2002. It directs the management of forest resources towards the national goals of environmental protection, biodiversity conservation, poverty reduction, economic development and good governance.

In line with national development plans defined by RGC, the forest sectoral plan aims towards the management of forest resources to maximise economic benefits whilst ensuring ecological sustainability, community benefits and habitat protection for native fauna and flora. It notes that the government has promoted nursery establishment, the selection of appropriate tree species, expansion of reforestation schemes and community forestry. To continue such endeavours DFW will "establish tree seed banks through the foundation of seed quality selection and maintenance centres, and seed source forest stands in major forested areas throughout the country" in order to "ensure the most effective reforestation in terms of economic benefit, genetic conservation, environmental protection, and service role" (DFW, 2001, cited in CTSP, 2003b).

According to the forestry law, provision is made for forest gene conservation within protection forest, and within special management areas of forest concessions. Application can be made to the Royal Government of Cambodia (RGC) by MAFF to designate appropriate areas of the permanent forest reserve as protection forest. Management plans will be prepared, implemented and enforced for these areas by the forest administration. Within the permanent forest reserve, the Minister of MAFF has the authority to issue permits for the establishment of botanical gardens or experimental stations, and the establishment of forest nurseries to provide seedlings. The law emphasises an increasing role for the Department of Forestry and Wildlife, the military and local people in tree planting activities. Annual planting areas and budgets have expanded accordingly.

The forest concession sub-decree, which was approved in 2000, highlights that within forest concession management, areas of natural biodiversity, ecosystem functions, and important forest services must be conserved and protected through the establishment of special management areas. Strategic management plans, submitted by forest concessionaires will be evaluated against a set of criteria that includes seed source conservation.

A forest genetic resource strategy is in the process of development. The process includes a number of diverse stakeholders, and covers the selection of priority species, species distribution and gene ecological zoning, conservation status of key populations, methods of conservation, and organisation and implementation of the strategy.
The RGC ratified the Convention on Biological Diversity (CBD) in 1995, and the forestry sector has been represented through the preparation of the mandatory National Report on Biological Diversity, and the National Biodiversity Strategy and Action Plan. The Government of Cambodia views the CBD as a framework to achieve sustainable development through the sustainable use and protection of biodiversity, and is now taking serious steps towards implementing conservation programmes and awareness-raising for the sound use and conservation of biodiversity resources. Links will be established with other relevant initiatives as they develop. Biosecurity regulations are not yet in place, although an inter-ministerial team is beginning to develop the National Biosafety Framework.

### Technical and biological issues

Identification and prioritisation of species for forest genetic conservation has been centred around three main criteria of socio-economic importance, level of within-species variation, and the level of threat or risk (FORGENMAP, 2002).

Tree improvement in Cambodia is commencing, and only very few activities have been carried out by the CTSP since 2002. Seed production areas for four species (*Dipterocarpus turbinatus*, *Hopea odorata*, *Aquilaria crassna*, and *Afzelia xylocarpa*) have been established in a 10 ha plot at Kbal Chhay, Sihanoukville.

Seed orchards for two species (*Tarrietia javanica* and *Shorea vulgaris*) have been planted in a two hectare plot at Kbal Chhay.

A provenance trial is being conducted by CTSP at Bak Sna where two species of *Afzelia xylocarpa* and *Pterocarpus macrocarpus* from six provenances will be planted in a 5 hectare plot in 2004.

### References cited


### 2.3 Indonesia

- There are not many changes to what was reported in 2001. However now there is a strong emphasis in the use of Biotechnological tools for the conservation programmes.
- Collaborative activities between Centre for Forest Biotechnology and Tree Improvement Research and Development (CFBTI), Yogyakarta and a number of forest companies have been initiated to test the 2nd generation *Eucalyptus pellita* and *Acacia mangium* in various parts of Indonesia.
2.4 Lao PDR

New updates in Lao PDR include the following:

- Provenance trial of some indigenous species like *C. tabularis*, *Azadirachta indica*, and *Eucalyptus camandulensis* have been established over 2001-2003.
- Biotechnology tools have been introduced for characterization, tree improvement and conservation activities.
- Three tissue culture laboratories have been established for teaching and for research activities.

2.5 Malaysia

No real change in the status of conservation activities as reported in 2001. Currently great emphasis has been given to international issues like climate change, carbon credit facility issues. The next COP7 meeting will be organized by Malaysia from 9-20th February 2004.

2.6 Myanmar

As of April, 2001 a new project entitled ‘Teak-based Multistoried agroforestry system: An integrated approach towards sustainable development of forests’ under ITTO Project PD 3/98 has been initiated. The project involves an agroforestry approach of planting teak with Xylia dolabriformis, Pterocarpus macrocarpus, Casia siamea, Hevea, Mangifera and cashew nut trees on an area of 270 hectares.

2.7 Philippines

No real changes to report from the last report in 2001.

2.8 Thailand

In Thailand some Institutional changes are taking place within the Royal Forest Department (RFD) where roles and responsibilities that was previously held by RFD is now being shared with the newly setup Department of National Park, Wildlife and Plant Conservation. The division of silviculture and botany and also the tree improvement groups now fall under the purview of this newly set up department. More details of the actual operation and functioning will be made available when clear details are available.

2.9 Vietnam

No real changes to report since the last report.

Important meetings held in the region 2001-2003

1. Workshop on Forest Management Certification and the Design of Local Auditing Systems, 4-6 December 2001, Cambodia
2. Training courses – Continuing Professional Education for Foresters in Vietnam- four courses conducted in October and December 2001.
3. Workshop on Participating Research Methodology (PRM), 23-27 July 2001, Royal University of Agriculture, Forest Research Institute and Department of Forestry and Wildlife, Cambodia.
5. 7th Round Table Conference on Dipterocarps, Kuala Lumpur, 7-10 October 2002. *(GTZ, APAFRI, FRIM, UPM, Forest Departments of Peninsular Malaysia, Sabah and Sarawak, Innoprise)*
7. Forest for Poverty Reduction: the changing role for development, research and training institutions, 17-18 June 2003, Dehra Dun, India. *(ICFRE, APAFRI, FAO-FORSPA)*
9. APFORGEN Inception Workshop, 15-17 July 2003. (*IPGRI, APAFRI, FAO*)
12. International Conference on Tropical Forests and Climate Change, 21-22 October 2003, Manila, Philippines. (*UPLB, Philippines Council for Agriculture, Forestry and Natural Resources Research Development, FPRDI, ERDB, University of Northern Philippines, APAFRI*)
### South East Asia (excl. China and India) list of species identified as high, global, regional and/or national priority.

Legend in Appendix 3

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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### Operations/ Activities

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<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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Int. PVT in progress. Hybrid
Good timber for ASEAN
MPTS. Need selection
Good for biomass & veneer
MPTS spp.
MPTS spp.
Timber species
Excellent timber for furniture
Threatened by aquaculture
Promising MPTS
Promising timber for ASEAN
Very important species
8. REGIONAL UPDATE FOR NORTHEAST ASIA

by W. Huoran

This report consists of a summary account of the development and activities in the conservation, management and utilization of the forest genetic resources of the region, Northeast Asia, including China, Japan, the Democratic Republic of Korea, the Republic of Korea, and Mongolia, since the 12th Session of the FAO Panel of Experts on Forest Gene Resources in November 2001.

1. Policy and institutional issues

In China, the National Forestry Administration (NFA, formerly the Ministry of Forestry), has the mandate to coordinate national and international programmes of FGR conservation, however the national Bureau of Environment Protection is also involved. Projects requiring governmental funding are normally approved by the Ministry of Science and Technology. As a research organization, the Chinese Academy of Forestry (CAF) is responsible for implementing conservation programmes in cooperation with provincial forestry agencies. Currently several conservation programmes, both national and international, are being carried out by the academy.

In regard to legislation and policy on biodiversity and conservation, the Chinese government has issued the following laws or regulations since 2001:

- The Law of Combating Desertification (National People’s Congress 2002);
- Regulation of Land use Conversion from Marginal Agriculture to Forestry (State Council 2002);
- Managerial certificate of producing and marketing tree seed (NFA 2003);
- Regulation of Plant Quarantine and Monitoring of Introduced Seed, Stocks and Other Genetic Materials (NAF 2003);
- Biosafety regulations of GM trees application (in progress). (for more detailed information visit http://www.forestry.gov.cn)
- Regulation of Assessment on Biosafety of GMOs in Agriculture, issued by the Ministry of Agriculture, China in January 2001 and put into force in March 2002. The assessment on biosafety of genetically modified plants, animals and micro-organisms and the control measures of security for GMOs and their derived products in agriculture are all included in separate annex to this regulation.
- Regulation of Security for Imported GMOs in Agriculture, issued by the Ministry of Agriculture, China in January 2002 and put into force in March 2003.
- Regulation of Labelling GMOs in Agriculture, issued by the Ministry of Agriculture, China in January 2002 and put into force in March 2003.

2. Technical and biological issues

NFA has decided in 2003 that bush community is calculated as a category of forest coverage in arid and semi-arid areas in north-western China in order to draw attention to the conservation, management and utilization of shrub gene resources which would, in a certain extent, implicate significance for other ecological regions in north-eastern Asia.

In China, 110 010 ha of industrial plantations were established in 2002, 35 622 ha were planted with eucalypts and acacias, 24 626 ha with *Pinus elliottii*, *P. taeda* and *P. caribaea*, 26 473 ha with poplars and paulownias, only were a few indigenous hardwoods and bamboos used despite of the rich diversity of the native forest flora. (http://www.forestry.gov.cn/lytj/index.asp). The national forestry authorities have, however, noticed that more indigenous species should be used in planting programmes in order to maintain biological diversity of forest ecosystems. [http://www.agri.gov.cn/_KeJiao/main/fag614.htm]
Conservation of biological diversity has achieved a great result, by the end of 2001, 1551 nature reserves have, for different purposes, been established in China in a total area of 145 million ha, which is accounted for 14.4% of the total land area. 85% of terrestrial ecosystem types are conserved in these reserves. The nature reserves established by the central government are 171, with area of 5.9 million ha, of which 21 are integrated into MAB network of UNESCO; and 3 are listed in the world heritage.

Japan, the Forestry Basic Law was established in 1964 to increase forest resources and wood supply. Forest resources are mainly managed for disaster prevention, environment protection and biodiversity conservation. The total area of forest is 25 million ha, of which 10 million ha are natural and 15 million ha planted, respectively, covering 70% of land area of Japan. About 60% of the forest resources are owned by small private land owners. (Annual report on Trends of Forestry, Fiscal Year 2000, Forestry Agency, Ministry of Agriculture, Forestry and Fisheries, Japan. 2001).

In South Korea, poplar breeding program has been undertaken to develop hybrids between \textit{P. alba} and \textit{P. glandulosa}, \textit{Populus nigra} X \textit{P. maximowiczii} and \textit{Populus koreana} X \textit{P. nigra} var. \textit{italica}. As an effort to screen exotic poplar species, 330 varieties were introduced from other countries and tested for growth and genetic stability. \textit{Populus euramericana} (I-214 and I-476) appeared to be the best exotic species for streamside and have been widely planted since 1962. Extensive planting of Italian poplars was partially stopped due to the poplar leaf rust, \textit{Melampsora sp.} which had been spread over many areas. Newly introduced \textit{P. euramericana} 'Eco 28' and \textit{P. deltoides} 'Lux' are resistant to the disease and thus are expected to substitute the Italian poplar clones. Another poplar species is \textit{Populus davidiana}. Other species in tree breeding programme include \textit{Ailanthus altissima}, \textit{Firmiana simplex}, \textit{Salix matsudana} and \textit{Ginkgo biloba}.

There have been great waves of reports from the public and media on biological invasion of exotic invasive species which have caused a great deal of economic losses and biological problems, however, no evidence has, at least in China, been found far in any case with the introduction and application of exotic woody species in forestry. For example, the introduction of exotic tree species has been a major program in Korea, 421 exotic species have been introduced from 38 countries into Korea.

Research into GM forest trees in China started in late 1980's and has developed very fast in the last few years. Having been approved by the State Council, for example, a national programme on research and commercialisation of GM plants in agriculture was jointly launched in 1999 by the Ministry of Finance and the Ministry of Science and Technology, 116 projects were financially supported by the programme, of these projects three were related with forest trees. Most of the research activities in GM forest trees are undertaken in the Chinese Academy of Forestry and forestry universities.

All research into GM forest trees was carried out with species or hybrids of broadleaved genera, \textit{Populus}, \textit{Eucalyptus} and \textit{Betula} for resistance to insect pests, disease pathogens and tolerance to environmental stress. GM trees, with genes resistant to insects, of \textit{Populus nigra} L. and hybrid clone 741 have been approved by the authority for commercialisation, over 300 ha of GM plantations have been established in China. Research into GM trees to lower lignin proportion in wood formation of larches is still in infancy stage. China has regulation framework and government policies on GMOs in place as mentioned above. There would exist less risks in genetic contamination to non-GM populations as harvested before reproductive mature, however, ecological risks must be closely monitored. Table 1 gives more detailed information on GM trees in NE Asia.

There is a gap to be bridged in knowledge between scientists doing research in traditional tree breeding and those in biotechnology. Scientists who work on biotechnology are mostly young generation with less experience in practical forestry and little interests in tree breeding and improvement programmes. On the other hand, people who are used to traditional tree breeding are mostly behind or not familiar with biotechnology, GM forest trees can not be used properly to develop a strategy for, or combination with, tree breeding programmes.
Another gap lays in research planning, research projects on GM trees are separated from applied tree breeding and improvement projects. Study on GM trees should be aimed at species which are of important economic value for commercial forestry other than species which are relatively technologically easier to work for genetic modification. The superb genetic materials selected by traditional breeding programmes should be used in genetic engineering. It is the real reason, perhaps, that a number of GM trees stopped in the laboratory stage without further activities to follow up.

Resources allocation is not balanced for research programmes on traditional breeding and on biotechnology, most of the governmental funds are given to the development of new technology. A few research projects on traditional tree breeding can survival today with seed orchards and provenance trials.

There are theoretical arguments in China among scientists on the topics, whether or not, that forest trees are genetically modified for resistance to disease and insect. The adaptation of insects and microorganisms to changing environment and host trees is faster than production cycle of GM trees, in other word, the natural evolution never stops as the ecological balance is being broken up. Given the consideration of the potential risks and impacts that GM trees would bring about, disease and insects can be effectively controlled to keep them below a certain level not to outbreak through the art of silviculture and forest management. On the other hand, GM forest trees are regarded differently from GM plants for food and agriculture, the latter poses direct effects on human health or impacts on environment. It can be foreseen that research and development of GM forest trees will even develop faster in the near future and there is no doubt that GM forest trees will be grown in large scale in plantation forestry and land reclamation in China as long as some technical obstacles are overcome in coming years.

It is suggested that a regional workshop be organized, with FAO assistance, to develop a network and strategy for conservation and sustainable utilization of the FGR in northeast Asia.
<table>
<thead>
<tr>
<th>Tree species</th>
<th>Research (R), Field testing (F), Environmental release (E), or Commercial planting (C)</th>
<th>Traits targeted</th>
<th>Gene(s) inserted</th>
<th>On going or Applied for</th>
<th>References</th>
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<td>Betula platyphylla</td>
<td>R</td>
<td>Insect resistance</td>
<td>Spider insecticidal peptide gene</td>
<td>On going</td>
<td>Zhan Yaguang et al. 2001</td>
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<td>Lowering lignin</td>
<td>C4H</td>
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<td>Chen ZZ et al. 2001</td>
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<td>Resistance to disease caused by Pseudomonas solanaceanum</td>
<td>cecropin D</td>
<td>On going</td>
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<td>Populus deltoides</td>
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<td>Populus deltoides x P. cathayana</td>
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<td>Resistance to leaf-eating insects</td>
<td>mtiD/gutD</td>
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<tr>
<td>Populus deltoides x P. simonii (N-106)</td>
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North East Asia list of species identified as high, global, regional and/or national priority.  
Legend in Appendix 3

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<td>9 10 11 12</td>
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## 8. REGIONAL UPDATE FOR NORTHEAST ASIA

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>End use of species</th>
<th>Exploration &amp; collection</th>
<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
<th>REMARKS</th>
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The issue of Forest Genetic Resources management has become a hot topic since many actors, especially scientist of different fields pointed out the urgent need to prevent the gradual degradation of the environment to continue. Because of the combined effect of population pressure on natural resources and inadequate land use practices in the rural areas the state of management of FGR has become critical.

Numbers of forest ecosystems as well as species genetic resources are degraded because of mismanagement. Despite of the growing awareness due to international conventions and many regional initiatives, most of the developing countries still lack appropriate legislations and strategies that could support a sustainable management of their FGRs.

Since the world sommit of RIO, notable improvement has been observed with most of them supported by international organisations such as FAO. For the progress to continue in a sustainable manner, a synergy of work between regions and countries and specialists is needed. Updating information related to FGR participates to this aim.

The present regional update concerns countries of the semi-arid zones of west Africa and Chad meaning the sahel and sudan ecological zones (FAO, 2001): Benin, Burkina Faso, Cape Vert, Gambia, Guinea, Mali, Mauritania, Niger, Senegal, Chad, Togo are the countries considered.

1. Policy and institutional issues

1.1 Institutions: new roles, responsibilities, capabilities, organisation

Involvement of local communities and privates in forest resources management is the new trend in forest policies of the developing countries.

It is now a fact that most of the sahelian countries have updated their forest laws or are in the process. New aspects underlined are the involvement of the local communities and privates in forest resources management. Different types of forest management method are therefore promoted in the countries depending on the types of forest and their production objective:

- Participatory Forest Management (*Forêts villageoises ou Communautaires*).
- Privatised Forest Management (*Forêts à gestion concédée au sector privé*).
- State Forest management (*Forêts à gestion étatique*).
- Decentralised state forest management (*Forêts communales et provinciales*).

After having adopted the Convention on Biodiversity, many semi-arid countries of West Africa have actually completed the process in writing their National Strategy and Action Plan (NSAP) on biodiversity. Under this process thematic reports and national monographs on the state of the countries biodiversity have been published. These documents represent valuable and official sources of information that have been considered in the present regional report. Future actions on forest genetic resources will have to consider the countries NSAP on biodiversity for better coherence of activities at national and regional levels.

In the following table the update of relevant information on legal texts available on FGR is summarised.
In Niger update of the forest low is actually under discussion in the parliament.

1.2 Specific legal issues

Material transfer agreement between:
- Burkina Faso and United Kingdom signed in 2000. National tree seed centre (CNSF) of Burkina Faso and Royal Botanical Gardens Kew (UK) are implementing the MTA.
- Mali and United Kingdom signed in 2003. IER (MALI) and RBG Kew are implementing the MTA.

2. Technical and biological issues

2.1 New FGR assessments, exploration, conservation programmes

Under the framework of the MTA agreements signed between the above 2 sahelian countries and the Millennium seed bank programme of UK, many species seeds have been collected including endemic species from Mali i.e. *Terminalia albida*. Full list of collection can be accessed in the following webpage: http://www.rbg.org.uk/msbp/inform/samara/samara5_English.pdf

2.2 Activities in germplasm supply, demand, procurement and exchange

Seed procurement is an important issue for reforestation programmes of West Africa to succeed. Nevertheless, many countries are limited by the lack of seed collection and storage facilities and insufficient competence in handling local species seed. Only two countries (Burkina Faso and Senegal) have well operating tree seed production units with a storage capacity of about 8 tones each. This is beyond the need of the region so that priority actions on seed supply at big scale should be encouraged.

*Khaya senegalensis* require special attention since there is a regular seed export market. For the last 6 years, seed are sold in big quantities every year to Central America and North Africa. The international growing market for *Khaya senegalensis* seeds dictate that due investment is made for the improvement and the conservation of the species in its area of distribution.
2.3 Threats to FGR, protection and conservation

_in-situ_ conservation activities:
- _Borassus aethiopum_ forest management project: Niger, Chad
- _Acacia senegal_ forest/populations management projects: Burkina, Niger, Mali?, Senegal?, Chad?
- Karite projects: Burkina, Mali, Senegal?, Guinea?, Benin?, Togo?,
- Agro forestry parklands management research projects: Burkina, Mali,
- Diverse forest management projects and National Parks: in all countries

_ex-situ_ conservation activities:
- Seed centres: Burkina, Niger?, Senegal, Togo,
- Botanical gardens: Benin, Guinea, Senegal,
- Herbaria: Benin, Burkina, Senegal, Cape Vert?
- Experimental plantations: in most of the countries

2.4 Development in tree selection, improvement and field evaluation

The need for tree selection and improvement work in the region is tremendous but still very little has been done. Attempts was made or is being done for some species: _Acacia senegal, Kaya senegalensis, Vitellaria paradoxa, Tamarindus indica, Acacia albida, Prosopis africana, Ziziphus mauritiana._

3. Operational and organisational issues

3.1 Activities in seed certification and registration

- Seed certification process started at CNSF Burkina
- Regional programme on seed production by the rural farmers (Project ISAC, ICRAF-DFSC

3.2 New development in training, education and extension

Abdou-Salam Ouédraogo Fellowship initiated by IPGRI is now completing his second year procedure to select a young scientist from sub-Saharan Africa that will benefit from a grant for research on forest genetic resource management related topics.

The Royal Botanical Gardens Kew with the support of the Darwin Initiative has started a project on seed research and conservation, which aims to train 32 scientists from 16 African countries and produce protocols and information on handling seeds of about 60 priority species. Two training sessions have been conducted so far alternatively in UK and Burkina (West Africa).

3.3 Financial scenarios and sources of funding

The UN conventions CCD and CBD have put in place mechanisms to finance projects of global or regional interest on forest resources management.

The Global Environment Facility (GEF) is one of them operating for many years now. GEF is funding management activities for most cross-boundaries protected forest and Natural Forest Ecosystems such as Forest Reserves and Parks (in BF, Niger, Mali, Chad, Mauritania, Senegal…). The Desert Margin Programme (DMP) managed by ICRISAT Sahelian Centre which concerns 4 sahelian countries (Burkina, Mali, Niger, and Senegal) and other dry land countries of East and South Africa is one of them. The DMP aims at improving natural resource management while improving rain fed crop productivity.
The Global Mechanism was recently put in place to finance projects related to the UN CCD. A project on Date Palm concerning Burkina Faso, Niger, Mali and Senegal is actually being promoted by this UN organisation with the scientific and technical support of ICRISAT sahelian Centre in Niamey, an institute of the CGIAR system dealing with genetic resources of the semi-arid regions.

FAO encouraged promotion of NWFP or tree crops in a number of countries through its TCP programme. Niger and Burkina Faso benefited the last 2 years from this programme, i.e. projects on date palm promotion.

3.4 Development of regional and international cooperation

An important tool for cooperation at regional level is the Regional Action Plan to Combat Desertification in West Africa and Chad coordinated by the sahelian organisation CILSS. This action plan which was published in 2000 has made and attempt to harmonise national action plans of West African countries (17 countries including Chad). Amongst the 8 themes that describe the priority sectors for intervention, “sustainable plant and animal resources management” comes second. Regional organisations and institutes that compose this thematic group are: UEMOA, ECOWAS, CILSS, OMVG, ALG, ADRAO, OMVS, Massif du Fouta Djallon, IPD/AOS, RIOD/OA, and MRU.

The Sub-Saharan forest genetic resources network (SAFORGEN) based in Benin is active in gathering information on woody species through commodities sub-network (medicinal plants, fruit plants, timber plants). A monograph on medicinal plants is already published and the group on fruit plants is also aiming to publish a monograph.

Annexes

Useful References


Oyen LPA. and Lemmens RHMJ (Eds.). 2002. Plant Resources of Tropical Africa. Precursor. PROTA Programme, Wageningen, the Netherlands

10. REGIONAL UPDATE FOR EASTERN AND SOUTHERN AFRICA

by B.N. Kigomo

The Eastern and Southern African (E/SA) countries covered in the present forest genetic resources updates include 22 national states. These countries include from north to south: Sudan, Eritrea, Ethiopia, Djibouti, Somalia, Kenya, Uganda, Rwanda, Burundi, Tanzania, Malawi, Zambia, Angola, Mozambique, Zimbabwe, Mauritius, Namibia, Botswana, Lesotho, Swaziland, Madagascar and South Africa. The 22 countries of Eastern and Southern Africa falls under three economic development sub-regions, i.e. Intergovernmental Authority on Drought and Development (IGADD), East Africa Community (EAC) and Southern African Development Community (SADC). In addition a single economic and marketing zone, COMESA (Common Market for Eastern and Southern Africa) stretches beyond the region from Egypt in the north to South Africa in the south.

Within the framework of the “international initiative on criteria and indicators for sustainable forest management” the Eastern and Southern Africa countries, with the exception of Tanzania, Madagascar and Angola, falls within the “Dry zone Africa Process” (FAO, 2003). At the regional content the Eastern and Southern Africa is mainly covered by vegetation types comprising genetic resources of tropical dry forests and woodlands with shrubs, and intermittent tall and low grasses occurring in well defined ecological zones. In addition, isolated distribution of tropical mountain system is found in parts of Eritrea, Ethiopia, Kenya, Malawi, Tanzania and Madagascar. The latter hosts rich diversity of unique forest genetic resources. Tropical moist deciduous forest zone is common in the coasts of Kenya, Tanzania, Mozambique and Madagascar and in the inland Malawi and Zambia. Lesotho and South Africa have sub tropical mountain system zone while Angola, Namibia, Somali and South Africa are partly occupied by the tropical desert zone and hence associated genetic pools of very dry vegetation types.

1. Policy and institutional issues

1.1 Institutions: new roles, responsibilities, capabilities, organization

Establishment of National Environmental Authorities.

Generally the establishment of National Authorities to deal with the problem of environment in the region is clearly notable. Over three quarters of the eastern and southern African countries have drafted policies, legislations and regulations to deal with the ever-increasing environmental abuse. The establishment of institutions, commonly referred to as ‘National Environmental Management Authorities’, has followed this development. The many sectoral policies and laws put in place to manage, on sustainable bases, natural resources in these countries have been found to be largely ineffective in controlling negative impacts. While maintaining the sectoral regulations, it is widely believed that an overall coordinating act and therefore authority would work as a watchdog to oversee the various activities across the many natural resource development sectors.

With the establishment of these framework authorities in the region, it is expected that since all activities in natural resources including forests must be guided by environmental impact assessments, gene pools of natural forest stands will be saved from further and fast erosion as experienced today.

1.2 New legislation, policy, strategies on forest genetic resources

Genetic resources policy initiative (GRPI)

GRPI is a new initiative (started February 2003) and is intended to take both a country and a regional perspective. IPGRI and IDRC are jointly coordinating the initiative. DGIS, IDRC, Rockefeller Foundation, BMZ and CIDA support GRPI. In Africa the case study locations include Egypt, Ethiopia and Zambia. The other core countries are Nepal, Vietnam and Peru. Two of the three regional focuses are in Africa i.e. “West and Central Africa” and “East Africa”. The third global region is “Andean Community” in Latin America. The IPGRI-SSA regional office in Nairobi will coordinate the GRPI.
The Global office in Nairobi will provide an international coordinating role to maximize synergies between the national and regional components.

Genetic Resources Policy initiative (GRPI) is a project aiming to strengthen the capacity of national policy makers in southern countries to develop comprehensive genetic resource policy frameworks. This is a newly established, four-year project and in the Eastern Africa region is being coordinated from the IPGRI (SSA), Nairobi office.

The participating countries where task forces for the project have been established in the region include: Egypt, Ethiopia and Zambia. The task forces are multi-stakeholder governance units with the responsibility of:

- undertaking surveys to collect and analyze data related to the demands and national priorities for policy research
- identifying gaps in information on genetic resources, and
- developing action research projects that include: drafting national legislation, training programmes, publications and contribution to web-based Policy Information Brokerage Service (PIBS).

Activities and contents of the outputs of the initiative also consider fruits and multiple use trees. It is anticipated that other countries in West, Central and East Africa will in the near future carry out similar activities.

1.3 Specific legal issues: access and property rights, material transfer agreements

Coordination efforts to regulate access to genetic resources and benefit sharing in Africa

Several organizations and groups in Africa have responsibilities in plant genetic resources within their mandates. These efforts are relevant to conservation of plant and forest genetic resources in East and Southern Africa region. Such groups include:

- New Partnership for Africa’s Development (NEPAD)
- Southern Africa Development Community (SADC)
- Common Market of Eastern and Southern Africa (COMESA)
- Organization of Africa Unit (OAU) – OAU model law on access and benefit sharing of genetic resources
- East Africa Community (EAC)

These group efforts include in their working strategies, the issues and possible mechanisms and guides on access to and benefit sharing of plant genetic resources.

1.4 Developments in forest management / ownership

Mechanisms and tools for Participatory forest management

Countries of the E/SA continue to develop mechanisms of involving communities in the management of forest and woodland resources. This is a major shift from the previous position where only the government had the full and sole responsibility of managing and use of the forests. Countries like Malawi and Tanzania have developed and started to put into practice some of their jointly developed ‘forest management plans’. Countries like Kenya and Ethiopia continue to develop such mechanisms but are yet to put them into practice as they await finalization of supporting regal frameworks.

It is anticipated that the involvement of local people will encourage them to see forests as their resource base of their livelihoods for now and in the future and therefore maintain these important gene pools in perpetuity.
2. Technical and biological issues

2.1 New FGR assessments, exploration, conservation programmes

- Reducing biodiversity loss at cross-border sites in East Africa
  Through an UNDP-GEF-FAO project, several cross-border forest conservation programmes have been established in East Africa involving different incentives. The project is relevant in the conservation of FGR in East Africa. The project is based around four areas of closed forest ecosystems in East Africa. The forests of study are shown in figure 1.

![Figure 1: Biodiversity study sites](image)

The focus of the project is to elaborate and to transfer rights and tenure to allow community forest management and sustainable use of forest genetic resource and the wider biodiversity. The project effectively involves the local communities in this focused development. It has been realized that joint forest management with clear roles, responsibilities and rights of partners might offer the way forward. The project therefore pays attention to the issues of tenure, access, ownership benefits (incentives) and institutional capacity to manage the components of the forest and woodland resource there in.


- East Africa Community Heads of Forest Organizations Meeting with CAMCORE on Forest Genetic Resources: 15th September 2003
  The three East African Community member countries, i.e. Kenya, Uganda and Tanzania met in Nairobi to discuss a strategy of benefiting from CAMCORE (International Cooperation for Tree Conservation and Domestication) global activities in improving and conservation of tree and forest genetic resources.

  The purpose of the one-day meeting was to review the status of forest genetic resources and tree improvement efforts in the region. The meeting also had the aim of strategizing how the regional countries could collaborate in making it possible to benefit from CAMCORE’s wide-spread effort of improving forest genetic resources especially the focus on tree breeding, improvement and conservation.

  The Director of COMCORE, the heads of Forest Departments, Research institutes, and University Forest Departments, in each of the three countries, attended the meeting. ICRAF (World Agro-forestry Center), International Services for Acquisition of Agri-Biotechnology Applications (ISAAA), two private consultants with interest in forest genetic resources, East African Community (EAC) Secretariat and a trustee NGO also attended the meeting. In total 32 participants took part in the presentations and discussions. ISAAA funded this consultative meeting in Nairobi.
The participants expressed their interests in acquiring and exchanging germplasm and expertise within the COMCORE Cooperative. A task force comprising of members of the three countries was formed to come up with a proposal for support on the regional tree improvement by and through the East African Community Secretariat. It was agreed that the proposal for the support should be submitted by November 2003 to facilitate consideration in the next relevant sub-committee meeting of the EAC Secretariat.

2.2 Developments in tree selection and improvement, field evaluation

- Collaboration between Mondi Forests Ltd of South Africa and East Africa countries in tree biotechnology projects

Due to the limitations of the number of tree species likely to be grown in plantations in the dry areas of East Africa, the Kenya Forest Department in collaboration with International Services for Acquisition of Agri-Biotechnology Applications (ISAAA) and support of GATBY Trust of UK discussed and agreed on the use of hybrids of Eucalyptus species for planting in marginal rainfall areas. The collaborative initiative approached the Mondi Forests in 2001 for use of its hybrids of *Eucalyptus grandis* X *Eucalyptus camaldulensis* (GC) and *E. grandis* X *E. urophylla* (GU).

A germplasm and expertise exchange agreement was entered between the four organizations. The government of Kenya also signed with Mondi Forests a material exchange agreement involving modalities of use of the exchanged clonal materials.

The “Forest Biotechnology Project” was thus born. To date, the Forest Department of Kenya has received 19 clones of GC and two of GU. A large clonal proliferation nursery has been established with the advice of Mondi. The nursery is capable of producing 3 million clonal seedlings per year. The nursery cannot meet the demand of the seedlings needed by farmers, private investors and NGOs working with community groups.

To facilitate more understanding of the areas suitable for planting of these species and viability of investing in Eucalyptus planting in the marginal rainfall areas, a system of monitoring of national trials of the clones and integrated pest management have been established and are assessed with the advice of the Kenya Forestry Research Institute. The trials and monitoring system is expected to address the trouble shooting areas as farmers/investors continue to expand the clonal tree materials into plantations and woodlots in farms.

In pursuit of the same approach and with the guidance of ISAAA, Uganda entered into similar effort in 2002 and Tanzania is in the process of entering into the same materials exchange agreement this year. The agreement process in Tanzania could be finalized by the end of 2003.

The experience with the Mondi Forests hybrid clonal materials is therefore about two years in Kenya, one year in Uganda and just starting in Tanzania.

So far growth in some clones has shown fantastic performance (7m/year in Kenya, and 10-12m/year in Uganda).

2.3 Threats to FGR, protection and conservation

- General threats of forest genetic resources

The E/SA region continues to loose large areas of its forestland. Most of these losses are attributed to excisions done to provide land for settlement and farming and a few for infrastructure developments. The main protection option still remains in the protection of forests and woodlands for the purpose of wildlife for tourism. The area under the system of national parks, sanctuaries and reserves in the region remains high and more stable, for example, Botswana (35%), Zambia (32%), Uganda (30%), Tanzania (15%), Sudan (11%), Namibia (11%), Mozambique (7%), Kenya (6%) and South Africa (5%). Awareness on the critical needs for conservation of forest genetic resources in the region require further attention, focusing not only to the local communities but also to the decision makers who seem slow in developing the necessary tools of mitigating degradation of he resources.
10. REGIONAL UPDATE FOR EASTERN AND SOUTHERN AFRICA

- Conservation of Indigenous fruits and Medicinal Trees in Eastern Africa
  Due to threats on genetic tree resources in the region and especially in the dry areas, attention has been recently given to fruit and medicinal trees with the aim of addressing areas of food security and health of the poor local communities. In pursuit of this requirement, IPGRI-SSA through the sub-Saharan Forest Network (SAFORGEN) and the Association of Forest Research Institutes of Eastern Africa (AFREA) are entering into collaboration to carry out work on prioritized fruit and medicinal trees. The countries in the region involved in the project are, Ethiopia, Kenya, Sudan and Uganda.

The project will initially collate and synthesize information and in particular status of research on genetic resources of fruit trees and identify genetic conservation gaps for intervention. The synthesis will then be analyzed through a workshop that will also give direction on a follow-up project as phase 2 of the collaborative initiative.

3. Operational and organizational issues

3.1 Driving forces underpinning the FGR field

- Pilot testing of information sharing system for global plan of action on plant genetic resources for food and agriculture in Africa
  Kenya and Ghana are the two countries in Africa selected for testing the mechanism for sharing and exchanging information in the monitoring of implementation of the Global Plan of Action (GPA) for Plant Genetic Resources for Food and Agriculture. The effort is being driven by FAO and IPGRI. In Kenya the process started in February 2003 and is expected to last (9) nine to (12) twelve months. The goal of the exercise is to contribute to the monitoring of the implementation of the GPA on PGRFA.

The strategy developed to enable the testing mainly aims at soliciting support from stakeholders for ownership of the process of developing a National Information Sharing System (NISS). Although the process is suspected to aim at agricultural crops and to arise from the 1996 PGRFA Leipzig declaration that excluded forests, the stakeholders involved in the present implementation testing exercise in Kenya and Ghana includes foresters and forestry organizations. It is not clear whether the Forest Department of the FAO is collaborating in the exercise to take advantage of possible relevant outputs of the initiative.

In summary the strategy of the initiative includes:
- Identifying a coordinating institution,
- Establishing a steering committee,
- Holding two national stakeholders meeting,
- Steering Committee maintains contact with stakeholders,
- Developing a participatory action plan for establishing an information sharing system in Kenya: action plan to include; stakeholder roles and responsibilities and time table for undertaking various activities.

Progress and achievement in Kenya

- Coordination
  The coordination institute is the Gene Bank of the Kenya Agricultural Research Institute. The steering committee consists of the following representatives of the stakeholders:
  - Kenya Forestry Research Institute,
  - Kenya Agricultural Research Institute,
  - Forest Department,
  - National Environmental Management Authority,
  - Ministry of Agriculture, and
  - IPGRI (Sub-Saharan Africa office in Nairobi)
Stakeholders assessment
Four priority areas were used to assess the relevant of stakeholders to be involved in the present activity. The priority areas included involvement in:

- in-situ conservation and development
- ex-situ conservation
- utilization of plant genetic resources, and
- institutional capacity building

The assessment of stakeholders according to the above four priority areas has been completed.

National workshop
The first national workshop was held at the end of July 2003. Twenty-eight stakeholder’s institutions participated in the workshop. The workshop agreed on:

- establishing a NISS in Kenya
- a National Focal Point (NFP)
- defined strategy for the establishment of a NISS
- definition of the terms of reference of the stakeholders, mainly the responsibilities of NFP, stakeholders and Steering Committee

Planned activities
- Data gathering and delivery
- Merging and distribution of data
- Second national workshop
- Producing a final report by NFP and distributing to stakeholders

3.2 Developments in training, education and extension

Training in tree breeding and improvement
The Forestry Division of the South African Council of Scientific and Industrial Research (CSIR), continued with its two weeks annual international short course in Tree Breeding. This course brings together tree breeders, geneticists, managers, and foresters from different parts of the world that get an opportunity to share and expand their knowledge of tree breeding techniques with a focus on mostly Eucalyptus and Pines species and their hybrids for both pulp and solid wood products. The course combines theoretical principles and practicals designed to empower participants to apply the gained knowledge and practice at all levels of development and implementation of their breeding programmes. This year’s course was held from 11th to 22nd August 2003 at Nerspruit, South Africa and attracted fifteen participants from seven different countries. Over half of the participants came from the eastern and southern Africa while the rest came from Asia.

3.3 Information management and dissemination

Ex-situ conservation of pines
FAO and DANIDA FSC have been working on ex-situ conservation of tropical pines. Participating countries in the Eastern Africa region have been the Kenya Forestry Research Institute (Kenya), Tanzania Forestry Research Institute (Tanzania) and Forest Department of Zambia. Societe de Development de Forets of Cote d’Ivore also participated in the activity.

The global experiment included 135 stands established at 39 different planting sites. The species under testing included Pinus caribaeae var. hondurensis, P. oocarpa and P. tecunumanii. The history of the development of the trials and constraints of assessing and monitoring of such long-term experiments under different nations are provided in the report.

The experience on this work was published in 2001 by FAO and DFSC, under the title: Practical experiences with ex situ conservation stands of Tropical pines’
SAFORGEN working with its member countries identified in 2001 priority tree species for conservation work in the next 5 years. The bases of selection of the priority trees were utilization status and potential as expressed by local people. The major criteria of prioritization were whether the trees were useful for food, fodder, timber or medicine.

Since the prioritization, SAFORGEN has developed concepts with partner countries and sought funding from donors. In one of such initiatives, a joint concept by SAFORGEN Secretariat, Kenya, Benin and Togo focusing on two fodder tree species, *Khaya senegalensis* and *Afzelia africana* in Benin, two fruit tree species, *Tamarindus indica* and *Dalium orientale* in Kenya and two medicinal tree species, *Nauclea latifolia* and *Alstonia bonnei* in Togo has been implemented. Due to the heavy demand of these species, they have become threatened and the need for their conservation efforts was found as a priority by the countries involved. UNEP therefore accepted to fund the project.

For proper conservation strategy to be developed, it was found necessary to carry out some prequisite studies to provide bases of conservation measures. The project thus undertook to develop methodologies for assessing genetic erosion; thus; level of diversity and erosion of the six species and to identify priority interventions (*in situ*, *ex situ* or both and complementary strategies) for conservation of the species.

The results of this FGR conservation study are published jointly by IPGRI and UNEP under the title; “Development of appropriate conservation strategies for African forest trees identified as priority species by SAFORGEN member countries”.

- State of Sub-Saharan forest genetic resources documented
  FAO, IPGRI, SAFORGEN, DFSC and ICRAF have jointly published, under the FAO Working Paper series, the state of forest genetic resources as reported by several African countries in an Ouagadougou, Burkina Faso meeting of September 1998. The summaries are reported in a December 2001 Working Paper FGR/18 E, in bulletins covering several countries that include; Eritrea, Ethiopia, Kenya, Sudan in Eastern African region. The series also cover several other Western Africa countries with dry land FGR. The publications came out of press in 2002.

### 3.4 Financial scenarios and sources of funding

- Small and short-term grants
  Large regional and national funding for forest genetic resources still remains low. As reported during the last panel meeting of 2001, the most important funding in the region that touches closely to the support for development of FGR is the UNEP/UNDP/GEF Biodiversity Projects Funding initiative. It is worth noting that aspects of forest genetic resources are partly addressed within the framework of the GEF biodiversity conservation projects.

Regional calls for small and short-term funding in FGR announced recently include:

- **Abdou-Salam Ouedraogo fellowship:**
  This fellowship is meant to provide grant for research in conservation and use of FGR in sub-Saharan Africa and is announced by IPGRI. A second cycle of this fellowship was announced this year. The present cycle will cover six months for young scientists (age below 35 years) to be attached to an IPGRI working center or site in one of the following; Nairobi, Cotonou, Douala or Kampala. The fellowship is worth US$10,000 to cover research, travel and subsistence.

- **Vavilov – Frankel fellowship 2004**
  In memory of Vavilov and Frankel, the fellowship is to fund conservation and use of plant genetic resources and is announced by IPGRI. It is meant to cover developing countries and for young scientists of 35 years and below. Research must be done outside own country for 3 – 12 months and maximum allocation per fellow is US $20,000.
References

Jaime Estrella – Project coordinator, Genetic Resources Policy initiative (GRPI), Nairobi Kenya. E-mail: j.estrella@cgiar.org Internet: www.ipgri.org

4. Recommendations on priority tree species and activities

The schedule in the Table below presents a species list showing those trees with highest priority and therefore requiring urgent attention. The list is derived from several meetings in the past on tree priority species. A consideration in prioritization is given to the different types of use put to the various species. Local communities highlight uses in fuel wood, food in the form of fruits, timber, poles, fodder and medicine as the most important. In addition to the foregoing consideration, threats on the species and its endangered status, as reflected in the IUCN species database and the CITES species listing for trade control, are also considered but less more locally in the prioritization of the species for urgent action.
**Outline for the list of priority species**

13th session of the Panel of experts on forest genetic resources

Legend in Appendix 3

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>END USE</th>
<th>OPERATIONS ACTIVITIES</th>
<th>REMARKS</th>
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<tr>
<td>Acacia Senegal (L.) Willd.</td>
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<td>Adansonia digitata L.</td>
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<td>Baikiaea plurijuga Harms</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Colophospermum mopane (J. Kirk &amp; Benth) J. Leonard</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Dalbergia melanoxylon Guill. &amp; Perr.</td>
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<td>Eucalyptus camaldulensis</td>
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<td>X</td>
<td>1</td>
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<tr>
<td>Eucalyptus hybrids/GC &amp; GU</td>
<td>X</td>
<td>X</td>
<td>1</td>
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<td>Faidherbia albida (Del.) A. Chev.</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Khaya anthotheca (Welv.) C. DC</td>
<td>X</td>
<td>X</td>
<td>2</td>
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<td>Milicia excelsa (Welv.) C.C. Berg</td>
<td>X</td>
<td>1</td>
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<tr>
<td>Prunus africana (Hook. F.) Kalkm.</td>
<td>X</td>
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<td>Pterocarpus angolensis DC</td>
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<tr>
<td>Schlerocarya birrea (A. Rich) Hochst.</td>
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<tr>
<td>Tamarindus indica L.</td>
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<tr>
<td>Trichilia ameica Vahl.</td>
<td>X</td>
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</table>
### 10. REGIONAL UPDATE FOR EASTERN AND SOUTHERN AFRICA

<table>
<thead>
<tr>
<th>Species</th>
<th>Risk Factors</th>
<th>IUCN and CITES Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitellaria paradoxa Gaertn</td>
<td>X X 1 1 1 1 2 2 2 Threated by overuse and clearing.</td>
<td></td>
</tr>
<tr>
<td>Warburgia salutaris (Bertol. F.) Chiov. and to some extent W. ugandensis Sprague</td>
<td>X X 1 1 2 2 1 1 2 Seed recalcitrant, seed supply problem, seed collections in progress, seed storage studies for W. ugandensis in progress.</td>
<td>IUCN and CITES listed.</td>
</tr>
<tr>
<td>Zizyphus mauritiana Lam.</td>
<td>X X 1 1 1 3 2 Threatened by overuse and land clearing</td>
<td></td>
</tr>
</tbody>
</table>

W-wood; NW-non-wood; FW-fuelwood; O-others
1. Policy and institutional issues

Australia ratified the Convention on Biological Diversity in 1993. The Convention has three primary objectives, the conservation of biological diversity, and the sustainable use of its components and the fair and equitable sharing of the benefits arising from the use of genetic resources.

Australia is a federation of six self-governing States and two self-governing mainland Territories. The Australian Government's powers and responsibilities are defined in the Australian Constitution.

Participation by Australia’s Federal Government in international activities relating to genetic resources is generally confined to active involvement in development of strategic policy frameworks and as appropriate capacity building and technology transfer activities through its overseas development assistance program. We participate in for such as the Convention on Biological Diversity (CBD) and through the United Nations Food and Agriculture Organization (FAO) in the development of strategic policy frameworks for access and management of genetic resources. A major focus of this work is defining links with other relevant organizations and in establishing internationally agreed frameworks and priority areas for cooperative action.

Australia’s national reports to the Conference of Parties to the CBD (http://www.biodiv.org/world/map.asp?ctr=au) contain information about Australia’s approach to biological resource use and management.

Genetic resources issues in Australia involve many different elements and many different organizations in a number of jurisdictions. There is no single Australian agency with exclusive responsibility for genetic resources matters.

The different spheres of government in Australia have a number of Ministerial councils which discuss and develop nationally consistent approaches on a range of issues. In October 2002, the Natural Resource Management Ministerial Council adopted the paper Nationally Consistent Approach For Access to and the Utilisation of Australia's Native Genetic and Biochemical Resources. (http://www.ea.gov.au/biodiversity/science/access/nca/index.html)

This nationally consistent approach complements actions already taken by Australian Governments to conserve and protect biodiversity. It underpins future action by governments when developing, or reviewing, legislative, administrative or policy measures on access and benefit-sharing. This nationally consistent approach, addresses that third objective of the Convention and in particular responsibilities set out at Articles 1, 3, 6, 8(j), 10(c) 15, 16 and 19.

Australia's governments have committed themselves to implementing the National Strategy for the Conservation of Australia's Biological Diversity (the National Strategy) as a matter of urgency. Objective 2.8 (Access to genetic resources) of that National Strategy states: "Ensure that the social and economic benefits of the use of genetic material and products derived from Australia's biological diversity accrue to Australia."

The operations of organisations such as CSIRO and State Forest Services and private seed suppliers, who have traditionally supplied Australian seed to overseas interests, will be influenced by this position. A difficulty for Australia remains communication with a number of international and regional institutions with an interest in forest genetic resources. Among these are FAO, IPGRI and the CBD.

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8 Salwood Asia Pacific, Australia. salwood@netspeed.com.au
Regional Update for Australia, New Zealand, Papua New Guinea and the Pacific

Agencies such as CSIRO’s Australian Tree Seed Centre are asked frequently to respond to detailed requests from fellow professionals in international organisations. A major Australian objective is to avoid duplication of effort and to ensure that work is undertaken on a complementary basis across the different fora. It is important that wherever possible international agencies cooperate with one another and their regional offices to ensure minimal duplication.

The Australian Tree Seed Centre (ATSC) (With thanks to Dr John Doran, Officer in Charge, Australian Tree Seed Centre). For further details visit: http://www.ffp.csiro.au/tigr/atscmain/index.htm

2002 marked 40 years of work on Australian Forest Genetic Resources by the Australian Tree Seed Centre. The Centre grew from its origins as a part of Australia’s commitment to the UN ‘Freedom from Hunger’ campaign requested by FAO in 1962, into one of the world’s premier genetic resource centres. It became part of CSIRO in 1975 and is currently part of the Forests of Tomorrow Centre of Excellence within CSIRO Forestry and Forest Products. Attached as Attachment 1, is a thoughtful paper prepared by Christel Palmberg-Lerche, the keynote speaker for the celebration seminar for the 40th birthday. The historical development of the centre is presented as Attachment 2.

More than 20,000 collection sites have been visited in this time, comprising many hundreds of thousands of trees from around Australia and neighbouring countries. More than 250,000 seedlots have been dispatched to 150 countries throughout the world.

Seed collection and dispatch remain core functions along with providing a central contact point for information about the woody component of Australia’s floral biodiversity and specialist training. The Centre is increasing its research on genetic diversity to support conservation and domestication activities.

The ATSC continues to receive valuable support from the Australian Centre for International Agricultural Research (ACIAR) and the Australian Agency for International Development (AusAID) and has received catalytic support from FAO for almost 40 years. ACIAR offers core support via the Domestication of Australian Trees Project (DAT), see: http://www.ffp.csiro.au/tigr/atscmain/whatwedo/projects/dat/dat.htm

Australian species continue to be a significant part of international plantation forestry. Broad planting statistics are:

- **Eucalypts**: 15 M hectares in 2000 (Turnbull & Booth 2002)
- Tropics – > 10 M ha dominated by Brazil 4 M ha & Asia 5 M ha
- Temperate – Spain, Portugal, Morocco, South Africa, China, Chile & Australia have eucalypt areas of 300,000 – 600,000 ha
- **Acacias**: > 2 M ha (primarily Acacia mangium, A. crasscarpa, A. mearnsii and A. saligna)
- **Casuarinas**: > 1.5 M ha (primarily Casuarina equisetifolia and C. cunninghamiana)

The general statistics for the ATSC 2001/02 follow:

**Seed in store**
- 1014 species (say 1500 including sub species and varieties – needs to be confirmed) of 104 genera
- 5366 provenances comprising 21,418 seedlots (bulk and individual)
- total seed weight is
- 51 seedlots of 30 species that are on the ‘rare, vulnerable, or threatened’ list
Seed collected
- 100 seedlots totalling 200kg

Seed distributed
- 349 orders processed – 257 to Australian clients (74%) and 92 to 39 other countries (26%)
- 698kg despatched in 4656 seedlots

Proposed name change for Australian Acacia species to Racosperma. This issue was mentioned at the last meeting of the Panel. It has the capacity to influence anyone who is involved with the Australian acacias. The genus Acacia is the second largest in the family Fabaceae, with about 1200 species. It is distributed throughout the tropical and warm temperate areas, but the large concentrations of species in Australia (ca 960 species) and Africa. The genus has a long and convoluted history, with many genera being split or added to core Acacia over the last 250 years. Acacia is currently lectotypified by Acacia nilotica (L.) of tropical Africa and has become naturalised in the Indian sub-Continent. In the last 20 years considerable consideration has been given to the phylogeny of this group, and proposals to subdivide the genus into three, first seriously proposed by Pedley (1983, 1986) now have considerable support from studies in many fields.

Such an action, while probably strongly desirable from the point of view of presenting a more defensible phylogeny, would have considerable nomenclatural, economic and pragmatic repercussions. More than 75% of the species in this very large genus would require a new name or combination. Many of these species are of considerable ecological, environmental, social or iconic importance. It can confidently be anticipated that name changes on this scale will elicit a major commentary in the popular and semipopular press, and it is inevitable that some of this comment will question the rationality of taxonomic process. Therefore, before proceeding, the taxonomic community has become engaged in careful consideration as to whether such wholesale change is really necessary and, if it is, to devise methods to minimise the impact of the change.

The formal proposal has now been published (on line at: http://leporello.ingentaselect.com/v1=9061425/cl=79/nw=1/psv/cw/lapt/00400262/v52n2/s31/p362). A paper suggesting an alternative treatment for Acacia taxonomy has been written by Judy West, Tony Orchard and Bruce Maslin and this has been passed to the Committee for Spermatophyta members who will judge this issue. The paper is also presented on the WorldWideWattle website (http://wattle.calm.wa.gov.au/ click on Taxonomy on the home page then select the article).

The Government of Western Australia (through its Department of Conservation and Land Management) and the Shire of Dalwallinu with support from CSIRO and others, is in the process of establishing a web site dedicated to the Acacias – World Wide Wattle (http://wattle.calm.wa.gov.au/). WWW is making progress and scientists have been focusing on getting content posted for the past couple of months. It is still in its developmental stage.

FloraSearch
Australia is facing some major challenges in combating dryland salinity. One of these challenges is the need for landscape scale change in landuse to reduce ground water recharge. An area of particular interest is the 250 and 600 mm rainfall zone lying in the southern states of SA, NSW and Victoria and extending to the northern extent of an area dominated by winter rainfall systems. Figure 1 highlights the areas of eastern Australia (green areas) of interest.

CSIRO is a partner in the FloraSearch Project – a long-term initiative which hopes to lead to the development of new woody perennial crops that will replace or be integrated into more traditional annual based farming systems in the wheat/sheep zone of southern Australia. The guiding principals of the project are that:

9 Notes provided by Bruce Maslin, WA Herbarium, Department of Conservation and Land Management, Perth, Western Australia)
• New crops need to be commercially viable
• Species be woody perennials
• Can provide feedstock to large scale industrial product production
• Cultivation will be dryland not irrigated, and focus on recharge areas not discharge sites.

There are six steps in the process to develop possible new product options based upon woody perennials:
Step 1: **Initial ranking of product options** based on assessment against a set of criteria appropriate to medium to low rainfall areas.
Step 2: **Initial ranking of species**, based on simple characteristics such as plant type (broad purpose, site preference or form), growth rate (using size and vigour to indicate productivity) and diversity/distribution (to indicate likely adaptability as a crop).
Step 3: **Testing plant material** from species selected in Step 2 for their suitability as feed-stocks for the products selected in Step 1.
Step 4: **Detailed selection of species** from among those found to be most prospective in Step 3, based on more intensive collection and analysis of plant data and analysis of more complex characteristics such as weed risk, tolerances to environmental stresses, ease of propagation, quantity and quality of yield and production systems.
Step 5: **Detailed testing of products and production processes** to determine the commercial feasibility of making products from feed-stocks produced from the most prospective species identified from Step 4.
Step 6: **Design of new integrated industries** for those species indicating best promise.

The product areas of highest priority identified so far include wood products (eg composites, pulp and paper etc), gums, essential oils, tannins and fodder. Although the focus so far has been on native species, it was considered important to review the potential of exotic species in the development of new crops.

The project has identified a number of exotic species worthy of further consideration in species trials and ultimately for crop development research. Figure 2 identifies those areas of the world that have close similarities with the rainfall of Australian target areas. It is expected that potentially attractive species will occur naturally in areas of the world with equivalent climatic conditions to southern Australia or have been demonstrated to grow successfully under cultivation in such climate zones.

![Australia map](image)

**Figure 1**: Australia – Green areas indicate parts of the winter rainfall zone receiving mean annual rainfall between 250 and 600 mm

The efforts which members of FAO’s Panel of Experts offered in contributing to this search are acknowledged with thanks.

**Priority lists for 2003**
*Pinus radiata (ex situ conservation), P. brutia, P. eldarica, P. pinaster*
Current events within New Zealand’s forestry sector
The New Zealand plantation forestry sector is continuing to face considerable challenges, partly in the nature of longer-term effects of the east-Asian economic recession. One of the major forestry corporates, Fletcher Challenge Forests (FCF) is up for sale, with shares trading at very depressed prices. A key subsidiary, the Central North Island Partnership (with CITIC, a Chinese government agency) has gone into receivership and this has compromised the sale of FCF. The other main corporate player, Carter Holt Harvey (effectively controlled by International Paper) is consolidating following a major corporate reorganisation. Prices for forest products have not really been buoyant, although the situation has been helped by exchange-rate movements.

Government funding of research has a declared focus on new technology to serve commercial ends, with the qualifier “[Plant Gene Technology] needs to maintain an effective platform of breeding and production research to deliver products to market.” What this means for funding work on genetic resources remains to be seen.

Radiata Pine
The reorganization of the NZ Radiata Pine Breeding Cooperative, which has now become a Limited Liability Company, is still incomplete. At least, partly as a result, work on genetic resources of the species remains essentially in a ‘holding pattern’. Crosses made using selections from ex-situ material of native populations continue to be raised and tended in progeny-trial plantings. However, some more significant major gene resource plantings have been or are being felled with only the collection of wood specimens to preserve research opportunities. Management of the existing breeding population continues apace, with increasing differentiation of specialised elite “breeds” for different sites and markets.

A study has been completed and published on the stiffness and bending strength of small clear timber specimens from an ex-situ planting of material from the three Californian mainland populations of radiata pine. Population differences were observed, but could be interpreted as entirely incidental to population differences in wood density.

New Zealand is participating in the IMPACT project (mentioned under the Australian component) which seeks to examine resistance to pitch canker.

Secondary species
We have had two important changes of personnel. One involves Luis (Luigi) Gea taking over as Project Manager, "New Plantation Species". The other involves the retirement of Gerry Vincent who had been working on the documentation of genetic resources of secondary or ‘alternative’ species [to radiata pine]. While he has not been replaced, work has continued on these species, largely in the way of producing new generations of material, even though various considerations have limited the population sizes that could be maintained.

Action taken, which has tended to as occasion has arisen for individual species, has included:
Establishing 2nd-generation progeny trials of Cupressus macrocarpa and C. lusitanica have been established, each on two sites. (Also, a levy on sales of genetically improved nursery stock of cypresses is being used for research funding in this area).

A broadly based collection of Pinus lambertiana from North America has been established on two sites, albeit with major losses that reflect the state of the sector.

Top-ranked hinoki (Chamaecyparis obtusa) clones from Japan have been established on one trial site and two woodlots.

With Eucalyptus nitens, two seed orchards and a very large clonal archive have been established, involving over 200 families.

With E. fastigata, a clonal archive and a seed orchard have been established.

With E. regnans, a seedlot form Moogara, Tasmania, is being perpetuated from a logging collection.

With E. delegatensis seed has been collected from 30 top families in a progeny test.

Species trials of various eucalypts have been assessed, data analysed, and results reported.

Stands of Larix spp. that are of genetic interest have been identified and documented.

A new generation of land-race stands is being produced from a seed collection of high-quality P. nigra var. laricio. Sales and plantings from the seed collection are being monitored.

A seed collection has been made during felling of a stand of P. patula.

Acacia dealbata - Utilisation study completed.

A. melanoxylon - Provenance introduction from NSW.

Sequoia and Sequoiadendron - Provenance trials (small) assessed.

Eucalyptus fastigata - replanting from local seed collections of Barrington Tops and Oberon provenances.

Pinus pinea - Regrafting of clonal archive of select Western Australian clones, in conjunction with Proseed.

P. muricata - Collection of seed from 3rd-generation stand of Mendocino Co origin.

P. pseudostrobus - Collection of seed before felling of plantation.

P. contorta - Regrafting of select clones of var. contorta.

Recent assessments of young Douglas-fir trials have corroborated results of earlier provenance trials, and indicated general superiority of plus-tree progenies.

Work that is planned, but not definitely scheduled includes: collection of seed from selected seedlots of coast redwood (Sequoia sempervirens) and Thuja plicata, and cuttings of hinoki.

There have, in the last year or so, been some unfortunate losses of gene-resource material in 'land-race' plantings and provenance trials. They have arisen in varying ways, ranging from forest owners with changing management personnel felling material in blissful ignorance, to our own people getting caught flat-footed when knowing that the owners wanted to fell material, and not fully waking up to the urgency and/or the potential importance of the material. Significant losses have involved high-quality plantations of Pinus monticola and P. lambertiana, and two important provenance trials, of Larix and Douglas-fir respectively.

Material of southern populations of P. muricata has been lost to disease in a field collection; while these populations are not of commercial interest they would not be widely available in collections.

**Royal commission on genetic modification**

On another front, there has been the widely publicised Royal Commission on Genetic Modification. It adopted a very broadly consultative approach, holding numerous hearings, including a travelling 'road show' around the country. Needless to say there were vehement and diverging opinions.
One 'expert witness', with high scientific credentials, who produced a witness brief from overseas for the Green Party of New Zealand, cited a paper in a reputable journal, and checks revealed that the paper was actually non-existent, a matter that has been reported in several publications. In the event, the Commission's verdict was to recommend "Proceed with caution"; this was based on a strong perception that the country needs to preserve its technological options, despite a lot of strong opposition. The political decisions are in the process of being made, the expectation being that Government will give a go-ahead for tightly controlled field trials of transgenic material to proceed, but impose a moratorium on commercial field release.


3. Papua New Guinea
(With thanks to Terry Warra, formerly Director, Papua New Guinea Forest Research Institute, currently Acting General Manager, National Forest service and Brian Gunn, CSIRO Project Leader, Domestication of Papua New Guinea’s indigenous forest species).

About 60% of the approximately 470 000 square kilometres of land in Papua New Guinea (PNG) is estimated to be forested and the country is floristically rich with more than 400 000 plant species. PNG is also renowned for its diverse and valuable tropical forest genetic resources including over 200 major commercial timber species. Forest genetic resources have an as yet largely untapped potential to make a major contribution to socio-economic development of the country, especially in rural areas. This resource can be used to underpin future developments in native forest management, agroforestry, non-wood forest products (NWFPs) and commercial forestry plantation development. The challenge PNG now faces is how best to develop these forest genetic resources on an economic and ecologically sustainable basis.

As a partial means of addressing this challenge the PNG National Forest Service through the Forest Research Institute (FRI) and CSIRO Forestry and Forest Products, with financial support from the Australian Centre for International Agricultural Research (ACIAR) have jointly developed a cooperative Research and Development programme to strengthen PNG’s capacity to conserve and better utilize the country’s forest genetic resources. The project ‘Domestication of Papua New Guinea’s indigenous forest species’ commenced on 1 January 2000 and will run for four years.

The following extract reports on progress made in domesticating PNG’s tree species.

Eaglewood (Gyrinops ledermannii)
Papua New Guinea is arguably one of the last frontiers in the world where the exploitation of natural stands of eaglewood is possible. The trade in eaglewood first commenced in the late 1990s. Prior to the demand for export of eaglewood, the tree species had not been regarded as having any cultural or commercial importance.

To date, only one species of eaglewood, Gyrinops ledermannii, is known to occur in Papua New Guinea. The lack of information and awareness of eaglewood is creating major problems exacerbated by the remoteness of producers and landowners who harvest the resin wood.

In response to the need for technical and scientific support, a management and conservation strategy document has been completed which identifies x priority activities.

- Taxonomy and distribution
- Conservation and management of existing stands of eaglewood
- Production of gaharu
- Management of the trade
- Regulatory environment and Government institutions
- Silviculture and management
- Transfer of information to resource owners
The Papua New Guinea Forest Authority, PNG Forest Research Institute, World Wide Fund for Nature, TRAFFIC Oceania, CSIRO Forestry and Forest Products together with land resource owners have been working together to develop the strategy and implement a number of activities to manage and sustain the industry. Key activities undertaken over the last year:

- Participatory Rural Appraisals involving land owner communities associated with eaglewood across PNG coupled with awareness campaigns (seven)
- Distribution of literature on eaglewood
- Development of eaglewood extractive reserves to enable resource owners to manage and conserve their own forest in exclusion of logging (14 step plan developed by WWF)
- Economic survey of the eaglewood trade
- Marketing strategy with links to international marketing strategy

PNG sandalwood (*Santalum macgregorii*)

- Management and conservation strategy developed for sandalwood which has been accepted by the PNG Forest Board.
- Range wide seed collection undertaken to capture the genetic variability in the species
- Ex situ conservation stand for PNG sandalwood established
- Research into vegetative propagation of the species ongoing

**Provenance/progeny trials**

Under the project ‘Domestication of PNG’s lesser known indigenous forest species’, implemented by PBG Forest Research Institute with support from CSIRO Forestry and Forest Products, provenance/progeny trials have been established for four PNG forest species.

*Calophyllum euryphyllum*
*Casuarina oligodon*
*Dracontomelon dao*
*Pomita pinnata*

In addition a species trial comprising 23 species has been established in Lae, an *Acacia mangium* SPA in gain trial has been established.

**Seed handling**

In formation to phenological data, seed handling and storage techniques and vegetative propagation of PNG species have been studied. Information on these studies has been written up in a booklet “Seed handling and propagation of PNG’s forest species” and will soon be published.

Seed research studies have been undertaken on PNG rainforest species using the IPGRI/ Danida Forest Seed Centre protocol on ‘Handling and storage of Recalcitrant and Intermediate tropical forest tree seeds’.

This project works strongly with many national counterparts, both in Government and NGOs. The PNG Ecoforestry Forum Inc (EFF) is one such institution and can be contacted through its National Coordinator, Mr. Thomas Paka, (tpaka.teff@global.net.pg; tel : 675 3239050).

**Domestication of indigenous fruits and nuts**

PNG has a rich natural and cultural heritage of indigenous nuts and fruit as for example *Canarium*, *Terminalia* and *Pometia*. Dr Roger Leakey (Professor of Agroecology Agroforestry, and Novel Crops Unit, School of Tropical Biology, James Cook University, Cairns, Australia. E-mail: roger.leakey@jcu.edu.au) is working with PNG colleagues on domestication of *Canarium*. 
11. REGIONAL UPDATE FOR AUSTRALIA, NEW ZEALAND, PAPUA NEW GUINEA AND THE PACIFIC

Essential oils
CSIRO continues to work with the Papua New Guinea Forest Research Institute and Australian research partners on the project Development of a Sustainable, Community-Based Essential Oil Industry in the Western Province of Papua New Guinea Using the Region's Woody-Plant Species. This receives support from ACIAR, CSIRO, the PNG Government and others.

SPRIG-2 (South Pacific Regional Initiative on Forest Genetic Resources) - Progress to October 2003. (With thanks to Dr Lex Thomson and SPRIG partners from Vanuatu, Tonga, Samoa, Solomon Islands and Fiji)

SPRIG-2 (South Pacific Regional Initiative on Forest Genetic Resources) is a five-year regional project in the South Pacific. Phase 2 commenced in May 2001 and with major funding (about US$2.5 Million) from the Australian Agency for International Development (AusAID). The project goal is “to help Pacific Island Countries to conserve, improve and better promote the wise use of the genetic resources of priority regional trees species to enhance environmental protection and to promote economic and rural development”. The main focus countries are Solomon Islands, Vanuatu, Fiji, Tonga and Samoa. However, SPRIG collaborates with all of the Pacific islands countries and territories (PICTs), and has assisted Kiribati, Marshall Islands, Palau, Cook Islands and Niue. An outline of the five components of SPRIG-2, their objectives, and some activities to dates are given below:

**Component 1. Institutional strengthening and regional networking:** The main objective is to strengthen the capacity of participating national and regional organisations in the South Pacific in the conservation and development of priority forest and tree genetic resources. Complementary objectives include:

- Facilitating networking of information and germplasm exchange among those working on South Pacific Forest and Tree genetic resources (including national, regional and international agencies, NGOs, industry, communities and individuals).
- Progressively integrate appropriate SPRIG conservation, tree improvement, training and information activities within national and regional organisations eg SPC, SPREP and USP and national institutions.

Some activities have included:

- Baseline survey of institutional capacity and training needs analysis in fields related to forest genetic resources.
- Regional short training courses in advanced tree seed collection practices, vegetative propagation, conservation of arboreal biodiversity and computer techniques for forest genetic resources work.
- Formal training of four project staff at the University of the South Pacific in biological and social sciences, at undergraduate and postgraduate levels.
- Provision of equipment for germplasm collection, seed testing, propagation, field trial assessment, computers and software, including SPRIG database of Pacific Islands tree species.
- Temporary relocation and databasing of more than 23,000 botanical specimens from Solomon Islands Herbarium, threatened by civil strife, to the University of South Pacific Regional Herbarium in Fiji.

Pangium edule, Santalum macgregorii, Schleinitzia fosbergii, S. insularum, S. novo-guineensis, Serianthes hooglandii, Terminalia kaernbachii, Turillia ferruginea, Turillia lutea, Turillia vitiensis, Vitex cofassus and Xanthostemon sp.

Component 2. Conservation and sustainable management of priority species:
The objective of this component is to help target PICTs to conserve, improve, and better promote the wise use of the genetic resources of priority regional tree species to enhance environmental protection and to promote economic and rural development. The main work has been on conservation of sandalwood species and populations (Santalum austrocaledonicum in Vanuatu and Santalum yasi in Fiji and Tonga), Pandanus tectorius cultivars in Kiribati and an undescribed Xanthostemon species in Solomon Islands. This work has included inventories of remnant populations, community surveys, production and distribution of information leaflets in local languages and establishment of field gene banks/seed stands.

Component 3. Tree improvement:
The objective of this component is to support and enable target PICs in the improvement of priority indigenous and exotic tree species and incorporate tree germplasm into commercial and smallholder plantings. Activities have included continued measurement of field trials established in Phase 1 of SPRIG, seed collections, propagation studies and new field trials (provenance/progeny) of priority species (Canarium indicum, Cordia subcordata, Santalum yasi, Terminalia catappa, Terminalia richii, Swietenia macrophylla) and development of tree improvement plans for Santalum, Swietenia macrophylla and Terminalia richii.

It is evident that thorough screening of genetic variation in priority exotic and indigenous Pacific, tree species can produce substantial gains in economically important characteristics. For example, in Fiji, some native seed sources of mahogany (Swietenia macrophylla), including Lancetilla (Honduras) and Los Chiles (Costa Rica) grow > 50% faster in volume terms compared the local mahogany sources planted in Fiji (which have mainly been derived from Belize). In Vanuatu the best seed sources/families of the promising indigenous plantation species whitewood (Endospermum medullosum) have grown > 50% faster in volume terms than the average. The best half-sibling families, mainly originating from south-east Santo, have grown rapidly during the first four years at 18 to 23 m³ ha⁻¹ yr⁻¹.

In Fiji grafted sandalwood plants have commenced fruiting less than a year from being grafted and this approach can be used to preserve endangered sandalwood remnants, aid seed production and speed up improvement.

Component 4. Demonstrating linkages between conservation, tree improvement and enhanced rural incomes: The objective is to demonstrate the linkages between conservation of forest and tree genetic resources and tree improvement in maintaining and enhancing sustainable rural incomes. The main activity has been in Tonga in the Ha‘apai Biodiversity Conservation Area involving Rural Development and Marketing Specialists to identify the most effective ways to sustainably utilize Ha‘apai’s tree resources. Some work with tree outgrowers in Solomon Islands and Vanuatu, and villagers interested in growing sandalwood in Fiji.

Component 5. Project management: The purpose of this component is to meet stated objectives of the four other components and complete project on time and within budget. In order for the project activities to become sustainable it is important that they become progressively incorporated into the annual workplans and budgets of the respective Forestry Departments and Regional organizations. An institutions specialist is presently developing a plan to best ensure that SPRIG activities are fully harmonized and integrated into national and regional organizations.
Attachments.

Attachment 1. Activity statement for the Australian Tree Seed Centre


Attachment 1. Activity statement for the Australian Tree Seed Centre
AUSTRALIAN TREE SEED CENTRE (Good Seed Does Not Cost – It Pays)

Mission: The exploration, domestication and conservation of Australian forest genetic resources

Resources: 40 years of experience in seed technology; 20 well-trained staff in-house plus access to CSIRO-wide scientific expertise; excellent facilities

Services:
Advice on collection, storage and germination of native seed
- collection strategies that address sustainability and genetic quality issues
- methods of collection (including documentation), processing and storage to ensure best physiological quality (viability)
- advice on propagation methods to ensure best germination rate

Seed collection and supply
- ATSC maintains the National Tree Seed Collection comprising of more than 20,000 seedlots covering 1500 taxa of Australian trees and shrubs
- 350 seed orders incorporating about 5000 source-identified seedlots (provenances and families) are processed annually – 70% of these orders are to Australian-based researchers and growers
- In addition to the collecting and processing of seed from natural stands (unimproved), ATSC with partners have developed a network of seed orchards to provide improved seed of key species

Plantation/Farm forestry
- advice on species and provenance selection for particular environmental conditions
- supply of selected source-identified seedlots (including seed orchard seed if available and appropriate)
- advice on statistical design, establishment and measurement of species/provenance/family trials
- analysis of trial data
- assessment of outcrossing rates in seed orchards using allozymes

Training/Information
- short term training in the fields of seed technology (collection, extraction, testing and storage), trial establishment techniques, design and analysis of field trials and tree breeding
- design, establishment and maintenance of seed production areas and seed orchards including controlled pollination techniques
- A wide range of relevant information (manuals, books, scientific papers) available through CSIRO.
- TREDAT, a tree performance data base, used to record and retrieve trial data and as a tool in selecting best adapted seedlots for specified sites

Research
ATSC undertakes a wide range of research activities compatible with its mission including —
- taxonomic revisions of species targeted for domestication are conducted where taxonomic variation is poorly-known
- genetic variation and the mating system of key species are characterised in studies using molecular markers
- floral biology studies are conducted for key species where their reproductive biology is poorly-known
- studies documenting the performance of species, provenances and/or families in field trials are routinely presented for key species. The ATSC trial database (TREDAT) is one of the most advanced electronic management tools for research seedlots available and its development is ongoing
- *ex-situ* conservation (seed and conservation/selection stands) have been established for important provenances of key commercial species and some threatened species; seed is made available for further research
- the essential oil profiles of numerous species have been characterised and breeding programs implemented to increase yields in some key species
- seed biology research includes the effects of long-term storage on viability and seedling vigour, and optimal temperature for germination among species

**Seed testing service**
- The ATSC offers a public seed testing service. A variety of tests are available which include germination, purity and moisture content testing. More information regarding this service is available at: http://www.ffp.csiro.au/tigr/atscmain/whatwedo/seedtesting/seedtest.htm

**Services and technical advice to development assistance programs**
ATSC participates in a range of development assistance programs outside of Australia supported by AusAID, Australian Centre for International Agricultural Research (ACIAR), NGOs and others. Current projects (sponsor) include – Domestication of Australian Trees Project (ACIAR); Development of Domestication Strategies for Commercially Important Species of Meliaceae (ACIAR); Papua New Guinea Domestication and Conservation Project (ACIAR); South Pacific Regional Initiative on Forest Genetic Resources (AusAID).
For further information about these and other ATSC activities visit www.ffp.csiro.au/tigr/atscmain
Good quality tree seed has always been the basis of successful planted forests. When Charles Lane-Poole became the first Inspector General of Forests of the Commonwealth Forestry Bureau in 1930 his appreciation of the need for the supply and correct processing of tree seed is evident in his statement ‘The whole question of seed supply of exotics is a serious one for Australia and efficient handling and storing must increase germination and plant percent and so decrease planting costs’ (Lane Poole 1931). His views were supported by succeeding Directors General and a seed activity was maintained in the Forestry and Timber Bureau primarily to service Australian needs.

During the 1950s there was an increasing interest in many countries in developing industrial tree plantations, especially of eucalypts (FAO 1955, 1956) and pines. By the end of the decade the area of eucalypt plantations worldwide was approaching one million hectares and it became urgent to have a reliable source of information and seeds of eucalypts to support the massive international tree plantation development.

A formal request by the Director-General of the United Nations Food and Agriculture Organization (FAO) to the Australian government to establish a Eucalyptus Clearing House service as a contribution to the Freedom from Hunger Campaign was made in August 1960. A positive response by Australia (Jacobs 1961) resulted in the appointment in 1962 of a professional forester, Egon Larsen, in the newly established Forest Research Institute to compile data relating to the distribution, ecology and growth habits of eucalypts, and to collect their seed for research purposes. This was the start of comprehensive tree seed collections that would form the basis of the activities of the Australian Tree Seed Centre (ATSC). Since then the scope of the collection has extended to virtually all Australian tree and shrub species including acacias, casuarinas, eucalypts, grevilleas and melaleucas (ATSC 2003).

Initially the work was hampered by incomplete taxonomic treatment of many Eucalyptus species. At that time there were about 500 species described (Blakely 1955) compared to over 700 today (Brooker and Kleinig 1999). There was a lack of reliable information on species’ distribution, breeding systems and timing of flowering and seeding. Overcoming these difficulties required close collaboration with botanists, plant scientists and foresters. A further problem was how to obtain representative seed samples of populations of trees that could be over 35 metres tall. Development of a technique using a rifle with telescopic sights to shoot down seed bearing branches was the solution (Boland et al. 1980). Apart from technical difficulties, the high cost of undertaking collections throughout Australia and in adjacent countries was problematical. External support was needed and this was forthcoming initially from FAO and later through Australia’s international development assistance agencies (Midgley 1988). Government agencies and private companies in other countries were encouraged to undertake collaborative seed collections with the ATSC.

Seed collected by teams from Brazil, France, South Africa, Spain, Zimbabwe etc. made a great contribution to the range of species and provenances available for distribution to researchers.

Today, ATSC has many functions within CSIRO Forestry and Forest Products. Its principal function is to provide high quality, well-documented seeds for research in industrial plantation forestry, agroforestry, land rehabilitation and other needs in Australia and elsewhere. This function is supported by the results of research in seed technology, genetic studies and breeding activities.
The ATSC publishes information on species distribution, ecology and genetic variation patterns of trees (e.g. Pinyosuparerker 1994; Kalinganiire and Pinyosuparerker 2000; McDonald et al. 2000), seed handling (e.g. Boland et al. 1980; Gunn 2001) and nursery techniques (e.g. Doran 1997, Quayle and Gunn 1998, Quayle et al. 2001) for foresters, botanists, horticulturists and a wide range of students, farmers and those interested in the cultivation of Australian trees. The seed bank includes seed of 1,500 taxa collected from thousands of individual trees throughout Australia and the staff provide consultancy services in Australia and in the many countries growing Australian trees (e.g. Kalinganiire 2002a & b).

Exploring the resource
Seed collection expeditions made throughout Australia, East Timor, Indonesia and Papua New Guinea have accumulated much information on species’ distribution and ecology and have enabled assessment of their potential for a wide variety of purposes. This information has been published in books such as ‘Forest Trees of Australia’ (Boland et al. 1984) and ‘Australian Trees and Shrubs: Species for Land Rehabilitation and Farm Planting in the Tropics’ (Doran and Turnbull 1997). Studies of genetic variation and physiological tolerances, such as to frost and salinity, in both laboratory and the field have enabled the reliable selection of species and provenances for planting in a wide range of environments (e.g. Aswathappa et al. 1986; Larmour et al. 2000). They have also contributed to resolving taxonomic problems in a range of tree genera (e.g. Harwood et al. 1997; McDonald and Maslin 2000; Butcher et al. 2001). ATSC has made a significant contribution to international forestry through its collection and distribution of seeds of previously little-known species such as Eucalyptus urophylla (from Indonesia and East Timor), E. camaldulensis (from tropical Australia), Acacia mangium and A. crassicarpa (from Australia and Papua New Guinea) which are now used in extensive plantations in many countries.

Tree domestication
Until recently almost all forestry plantations were based on seed collected in wild populations or unselected plantations. ATSC has participated fully in the challenging process of exploration and manipulation of the wild genetic resource to derive uses and products for maximum social benefit that is referred to as ‘domestication’ (Midgley 1995). Now the majority of plantations of Australian trees are more productive because they are derived from seed orchards and other selected stands that have benefited from the domestication process. This is in contrast to the genetic deterioration that commonly occurs in unmanaged exotic ‘land races’ of Australian species, through inbreeding and hybridization (Eldridge et al. 1993). It has not been uncommon for productivity gains of up to 300 per cent (relative to poorly selected seed sources) to be achieved simply by using a selected, well-adapted seed source (Eldridge et al. 1993). ATSC scientists have been involved indirectly in most of the breeding through providing seed for the base populations.

Notable contributions have been made to industrial plantation forestry with species such as E. globulus, E. grandis, E. camaldulensis, for pulp wood (e.g. Eldridge et al. 1993), with Acacia species for both industrial forestry and agroforestry (Butcher et al. 1996; Midgley and Turnbull 2003); and Melaleuca species to the tea tree oil industry (Doran et al. 2002). Work with Grevillea robusta and with selected sources of E. camaldulensis has been a major contribution to agroforestry and to rehabilitation of saline lands respectively (e.g. Midgley et al. 1987; Harwood et al. 2002). Human food security in semi-arid areas has been an important R&D focus for the Centre since 1991. Seeds of certain Australian Acacia species (e.g. A. colei, A. tumida and A. victoriana) have been used as a traditional food source by Australian Aboriginal peoples for centuries. These acacias have vast potential to provide new food crops in semi-arid regions of the developing, tropical world vulnerable to periodic famine such as parts of West Africa and dry regions of southern India (Rinaudo 2002). ATSC recognized this potential (Thomson 1989) and has facilitated a range of research and development activities (species trials, nutritional and safety studies) in Aboriginal communities in central Australia and in West Africa to promote the broader-scale planting of these species (House and Harwood 1992; Harwood et al. 1999). There are now over 15-20 million hectares of eucalypts and over 2 million hectares of Australian acacias planted worldwide.

Conservation
The process of domestication of many Australian trees has highlighted the need for conservation of the genetic resources. Seeds stored in controlled conditions in the ATSC store provide only short-term conservation but longer term conservation is assisted by the many planted stands throughout the world.
ATSC has established ex-situ gene conservation stands of several rare and vulnerable eucalypt species (e.g. *E. benthamii*). However, it is still essential that there is adequate conservation of the genetic resources of Australian trees and shrubs in their natural environments. The Centre is a core ex-situ conservation facility supporting in-situ conservation efforts by other agencies in Australia (Anon 1998).

**Future**

The early years of ATSC saw much exploration of the Australian woody flora to meet growing local and international needs for a wide range of wood products and environmental services. The scale and scope of such needs has continued to grow providing continuing challenges. It is likely that ATSC activities will now focus on tree improvement, especially the breeding phase of the domestication process. The breadth of genetic resources in Australia along with the seeds already collected and stored at ATSC are a valuable resource of great significance for the future use and development of Australian trees in Australia and throughout the world.

**Bibliography**


Lane Poole, C.E. (1931). Annual Report, Commonwealth Forestry Bureau, Canberra.


FOREST GENETIC RESOURCES
INTERNATIONAL AND AUSTRALIAN PERSPECTIVES10

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SUMMARY

Trees constitute key components in a healthy environment, and are of pivotal importance to human and societal development. While most other plants are viewed rather dispassionately and food crops are viewed as “commodities”, trees are frequently given intrinsic moral and ethical values. Such values are additional to the range of wood and non-wood products and environmental services provided by forests and forest ecosystems. Australian trees have over the past century yielded a number of goods of importance to the national economy. In addition, the distribution and trade in Australian tree seeds has, over the past 200 years, been a resource which has benefited Australia; these benefits have, however, been most pronounced in a large number of countries in the Mediterranean, and in the tropics and subtropics, which have introduced Australian tree species and established large areas of forest plantations for productive and protective purposes. The paper traces the history of forest genetic resources work in Australia, with special reference to the collection, handling and distribution of seeds, information and know-how, starting from the founding in 1962 of The Eucalyptus Clearing House, established by the Forestry and Timber Bureau in response to calls for action within the FAO Freedom for Hunger Campaign, and as a contribution to activities of the World Seed Year in 1961; through to modern days and the Australian Tree Seed Centre, a highly skilled, specialized unit, attached to the CSIRO Division of Forestry and Forest Products.

10 Keynote Address presented at the 40 Year Jubilee Celebrations of the Australian Tree seed Centre.
Canberra, Australia 22 August 2002.

The paper acknowledges the unique Australian contribution to national and international efforts in the conservation and wise use of forest genetic resources, supported by the work of the ATSC. It places Australian achievements over the past decades within the context of international developments, reviewing the history of seed exchange, advances in tree breeding and in related fields of science, and comments on the relevance and likely effects of new international agreements and regulatory frameworks. Finally, some predictions and suggestions are made related to the future role of the ATSC.

SOME REFLECTIONS ON THE HISTORY OF FORESTRY

It has rightly been said that trees are at the very basis of life on this planet. They constitute key components in a healthy environment, and they are of pivotal importance to human and societal development. Their presence throughout history has enabled the growth of cultures and productivity; their absence has routinely diminished the likelihood of both. Human responses to threats or loss of trees are often passionate and emotional. While most other plants are viewed rather dispassionately and food crops are viewed as “commodities”, trees are frequently given intrinsic moral and ethical values (Bouke 2001). Forests of course also provide wood and non-wood products which constitute one of the largest, but often less publicized and publicly noted economic sectors worldwide, underpinning the economies of many nations. The role of trees and shrubs in the provision of goods for rural communities is fundamental to well-being and food security; their role in watershed management, soil stabilization, rehabilitation of degraded lands, and as providers of shade, shelter and other services, is at times maybe even more fundamentally important than are their multiple productive roles. Over the past decade, the role of forests and forest ecosystems as guardians and habitats for biological diversity has been much highlighted and may today better known to the man-on-the-street than their productive, protective and social functions.

Some 10,000 years ago, agriculture began, with the Neolithic revolution. As my FAO colleague, Clive Stannard noted in a recent publication, “we are still coasting on the Neolithic” (Stannard 2002). Over the centuries local farming communities - in repeated bursts of creativity - applied invention to the most promising of the wild plants around them, and substantially added value to them. Crop and animal domestication made settled life possible, and human populations grew exponentially. Population density led generation after generation to move over the next hill, and in so doing they spread their crops and other species useful to Man into new environments. Looking at the more recent past, the human population at the beginning of the 20th century was some 1.6 billion, by the middle of the century this had increased to 2.5 billion, and in the year 2000, world population had exceeded 6 billion. In parallel with population increase, aspirations for higher standards of living have multiplied per capita consumption of resources (Lanly and Allen 1991). Between 1960 and 1995, during which the human population almost doubled, the world economy increased 3 ½ fold. In forestry, the area of plantations increased from 18 to 44 million hectares. In 1990, 23% of the plantations in the tropics were eucalypts, 8% acacias (Carle et al. 2002).

Looking more at the recent development of human perception of forests and forestry, in the 1950s and early 1960s, the main focus was on industrial species. Development was largely perceived as industrial development. Many Forestry Departments, including the Forestry and Timber Bureau and the Forest Research Institute of Australia, were at the time administratively located in the Ministries of Primary Industries.

Accordingly, the World Symposium on Man-Made Forests-1967, organized by FAO and IUFRO in collaboration with the Government of Australia, in Canberra in 1967, stressed that forestry, no less than agriculture, must pursue the technological revolution, where production is obtained from smaller areas through greater inputs. There was a strong emphasis on economic growth and rising material well-being (FAO 1967, 1967a).
At the same time, the need to focus on the needs of increasing populations, especially in tropical countries, was highlighted in international circles, noting the need to pay attention to shelterbelts to protect crops and to the overall role of forestry in increased food production. In addition to the need to select and breed trees to produce high-yielding timber varieties, the role of forestry in establishing forest plantations on difficult sites and in expanding urban areas, was stressed by the First World Consultation on Forest Tree Breeding in Stockholm in 1963 (FAO 1964). Thus, the multiple functions of trees and forests were understood well already at that time.

In the 1970s and the 1980s there was an increased realization in the world of the fundamental need for rural development as a cornerstone for national well-being. Agroforestry species, multipurpose species for food and fodder, and not least fuelwood producing tree species, was increasingly in focus. Correspondingly, many Forestry Departments were administratively moved to become part of Ministries of Agriculture.

Genetic conservation became an acknowledged, urgent need in the wake of discussions in fora such as the UN Conference on the Human Environment held in Stockholm in 1972. The need to pay attention to land use planning and the wise management of forests, was strengthened by the subsequent release by FAO of the 1980 Forest Resources Assessment (FAO 1982), which was the first truly global such assessment of state and trends. Following discussion around these issues, the 1990s, in turn, became the decade marked by increased environmental concerns; and Forestry Departments in many countries were administratively moved to become part of the Ministries of the Environment. Towards the end of the 1990s, the social dimensions of forests and forestry became more pronounced. The Third International Tree Breeding Consultation held in Canberra in 1977, strongly underlined the importance of widening economic analysis of tree improvement programmes to include estimates not only of financial, but also of net social, benefits (FAO 1977, 1979). In the 21st century, a "scientific fix" is frequently looked for, with stronger influence from, and links, between Forest Departments and Ministries of Science.

The above developments have been underpinned by perceptions of forests which have gone from “Nature is a Threat”; to, “Man Conquers Nature”, to “Back to Nature”. As recently as in the Canberra Man-Made Forests Symposium (FAO 1967, 1967a), Jack Westoby of FAO drew attention to the important contribution which man-made forests can make in what he called, “Man’s ceaseless struggle to master his environment”. More recently, the perception of Nature against Man and Man against Nature, at least in many industrialized countries, has been followed by a re-awakened, "Back to nature"- emphasis. Modern man shies away from change, and in the erroneous belief that nature is static, and that the present state is ideal, wishes to stop all human intervention in forests and forest ecosystems. Maybe, here, Man is actually looking for some kind of “Eternal Youth”… which, unfortunately, does not exist! This syndrome has pointedly also been called, “The nostalgia of wilderness” (Thirgood 1981).

It is interesting to note that in 1947, the Grand Old Man of tropical forestry, André Marie Aubreville, in an article published in issue number 1, volume 1, of the FAO journal Unasylva, noted wisely: “Man has set fire to the forest for the same reason that he has hunted, in order to be able to survive in the midst of a hostile nature. By destroying indiscriminately, however, he has only added to the difficulties a tropical climate imposes” (Aubreville 1947).

Honest, common sense also came through in a book which I recently read on Forestry Research in Finnish Lapland, way north of the Arctic Circle which, in an attempt to balance the extreme positions and varying perceptions opposed to each other in today’s world, noted: “Nature is a friend, but Nature is also at the same time a fierce and merciless competitor and can be a frightening foe”. Subsequent chapters in the book made serious attempts to review forest management as a tool to balance the economic, environmental, social and spiritual values of forests (Varmola and Tapaninen 2001).
The late Gene Namkoong—a pillar in modern forest tree breeding and a great thinker and philosopher—in one of his last articles stressed that forests were, “the epitome of diversity” (Namkoong 2001). He noted that present efforts at forest management and conservation often reflected values of dominant economic powers or a preservationist counter-culture, neither of which brought any higher level of justice to the people affected or concerned.

He saw it as our obligation not to abuse this complex system through ignorance, and to avoid management which would simplify forests to manufacturing factories, or attempt to restore or preserve, “a world that never existed”. He highlighted the evolutionary interdependence between forests and humans, and the need to focus on the issue of how to manage forest ecosystems, rather then whether to manage them (Namkoong 2002).

VALUE OF EXTERNAL REVENUE FROM AUSTRALIAN TREES TO AUSTRALIA

Australia is a mega-diverse continent in terms of biodiversity with more than 80% endemism in its more than 44,000 flowering plants. Two of the most visible tree genera, Eucalyptus and Acacia, together comprise about 2,500 species (Anon 1998, 2002e,f).

Australian timber was exported long before the country shipped wool, wheat, butter, fruit and metals to Europe. These timbers were known for their exceptional hardness or, conversely, for the ease with which they could be worked. In addition, Australian trees have over the past century yielded a number of other goods of importance to the national economy. Reportedly, about $US 200,000 worth of routine, a eucalypt extract, was exported from Australia to the USA every year in the 1960s (Stivens 1966). In the 1950s, cineole-rich foliar oil from Eucalyptus polybractea, was an important commodity, as is presently foliar tea tree oil extracted from Melaleuca alternifolia (Anon 1994). Exporting seed from State Forest Services generated trade benefits to Australia of around $A 5 million per year in the 1980s (Anon 1988), and the 25-30 tonnes of seed annually exported from Australia in the 1990s were reportedly valued at some $A 9-12 million (Anon 2002f).

HISTORY OF SEED EXCHANGE

The FAO document, “Handling Forest Tree Seed”, published in 1955 (FAO 1955a), noted: “Some parts of the world have an abundance and others are lacking tree species. International exchange of tree seeds is an opportunity to share the world's forest wealth.”

“There is something very fitting about the exchange of seeds between nations. In distributing seeds of its native trees, a nation loses nothing of its own resources, but [provides] other countries with trees that have been its wealth and pride.”. Already at that time, 50 years before the invention of the word, “biosafety”, the book noted: “There are, however, certain dangers, and care must therefore be used to see that only the best stock of suitable geographic source is utilized, and that no diseases, insects or noxious weeds are inadvertently imported.”

The international transfer of germplasm and cultivation of agricultural, forestry and other introduced plant species have long histories. Apart from helping human populations to meet basic needs of food and fibre, exotic plants have at times helped direct or change history. As noted by Midgley, in the late 15th Century, a European craving for pepper and spices influenced the Portuguese, Italian and Spanish exploration of other continents; sugar cane and the need for labour for its cultivation led to trans-Atlantic slave trade and shaped the modern Caribbean; the potato and its narrow genetic base and pest problems in Ireland in the mid-1980s led directly to one of the great human migrations in history (Midgley 1999).

Vigorous action to introduce forest tree species from other countries was also evident already early in the 20th century. As an example of the boom in forest tree seed trade, the Danish author, N.E. Tulstrup, in a fascinating article in Unasylva in 1959, noted that during the winter 1901-02, one single seed firm in Darmstadt, Germany received from France and Belgium more than 200 railway truck-loads of Scots pine cones. The seed was widely distributed in Germany and neighbouring countries from a kiln in the city, simply as seed of "Darmstadt origin" (Tulstrup 1959).
No wonder that Central Europe has over the past years experienced problems with extensive areas of mal-adapted forests, reportedly of “native species”, which are dying of causes attributed to anything from acid rain to climate change, insects and diseases!

Inter-continental trade in forest seed was first documented in the early days of the eighteenth century, when seed of several eastern American species were shipped to Europe for use as ornamentals. Plantations of species such as *Picea glauca* and *Pinus strobus*, and some North American hardwood species, were also established in Europe at the time. The first introductions of eucalypts into the Mediterranean region took place in the early 1800's, and large-scale plantations were established in the second half of the century. In some of today’s main eucalypt-planting countries, such as Brazil, large-scale plantations were started in 1910 or later. China first introduced eucalypts in the 1890s (FAO 1956a). By 1998, China had close to one million hectares of eucalypt plantations (Midgley 1999; FAO 2002).

In the wake of increasing interest, FAO and the Forestry and Timber Bureau organized a two-month *International Study Tour on Eucalypt* in Australia in 1952. Forestry experts from 24 countries participated in this tour, with the purpose of familiarizing themselves with the natural environment of eucalypts of actual or potential value to other countries. Country reports prepared by the participants showed that eucalypts had been planted in more than 50 Mediterranean, sub-tropical and tropical countries, for a range of purposes, (mainly for firewood, but also for posts, poles, mining timber and charcoal, for railway sleepers, sawnwood, pulpwod and as windbreaks, in land reclamation, soil fixation and for the production of oils, other extractives and foodstuffs such as honey). The two countries that at that time had introduced the largest number of eucalypt species were Brazil and South Africa. At the same time, it was noted that, while some 30 species of eucalypts in Australia were used for industry at a relatively large scale, little eucalypt planting had taken place in the country up to that time (FAO 1955).

A *First World Eucalyptus Conference*, was organized by FAO in Rome in 1956. The purpose of the conference was to discuss the advantages and the disadvantages of eucalypts, and to review progress in research, silviculture and utilization. The conference noted that, thanks to the adaptability and versatility of species of *Eucalyptus*, they were rapidly being introduced in a number of countries: “Species of [the genus *Eucalyptus*] have made it possible to reclaim and afforest waste lands, fix dunes, increase crop yields through shelter afforded by windbreaks, and augment farm returns by plantations in various forms” (FAO 1956a).

Interestingly, the Conference addressed the fears expressed in certain circles concerning an excessive extension of planting as regards both soil evolution and possible difficulties in utilizing the timber produced. In the conclusions it was however noted that such fears were generally groundless, or greatly compensated by, “the immediate anticipated physical, economic and social advantages of planting eucalypts on land unsuited for farming or no longer farmed, or in replenishment of degraded forests”. Possible adverse effects were, moreover, “limited by the prospects opened up by the conversion of [eucalypt] plantations into relatively stable formations by means of associated [local] species.” Potential problems could be avoided, “with all the techniques, care and protection that such [tree] crops require”.

These statements, made in 1956, are very much in line with the findings of the FAO study carried out in the mid 1980s on the ecological effects of species of the genus *Eucalyptus* and published as Forestry Paper 59 (FAO 1985).

In relation to future markets, the 1st *Eucalyptus Conference* (op.cit.) noted: “Supply of abundant, regular, easily accessible and therefore cheap produce, will always find a market in very many regions”. This same principle was echoed in the first edition of the FAO book, “Eucalypts for Planting”, which had been published just prior to the meeting, in 1955, which noted, maybe in a somewhat overly critical manner, and without giving credit to the principle, “Beauty is in the Eye of the Beholder”: “In many countries, the most pressing forestry problem is quick production, not so much high quality timber.”
Eucalypts provide remarkable material for planters who, in the regions of the globe poorest in forest resources, believe in the efficient production of wood in quantity, even if the crops grown do not measure up to the exacting standards of silviculturists of the old school or truly represent ‘the forest beautiful’” (FAO 1955). Fast growth of eucalypts, more than beauty, was also stressed by Dal Stivens who, in an article in 1966 published in Unasylva noted: “…eucalypts outside of Australia, [are reported to grow much] faster than they do in their homeland; that is [at least] what some Californians claim, but they have been known to make extravagant claims before’” (Stivens 1966).

By the time of the second FAO World Eucalyptus Conference, held in São Paulo, Brazil in 1961, close to one half of a million hectares had been planted with eucalypts in that country, and 144 species of this genus had been field tested, covering many climatic regions (FAO 1961). The area of eucalypts in Brazil is today just under 3 million hectares (FAO 2002).

Since the 1920's, much evidence accumulated which showed the importance of seed source and provenance for adaptation and growth. Despite this realization, and despite vigorous dissemination of information on the importance to ensuring that seed used was of good physiological quality, international trade in forest tree seed continued to rely on the lowest bid. Despite the “common knowledge” that seed quality will decisively influence the success or failure of tree planting projects, seed matters are still today often considered peripheral to mainstream forestry. In the Second Eucalypt Conference, one of the Grand Old Men of Australia, Max Jacobs, noted: “Tree-planting programmes in many countries are still at the stage of using seed and stock from the most readily available sources, frequently irrespective of species and generally irrespective of quality and origin” (Jacobs 1961). Steve Midgley and co-authors, almost 40 years later, in the Beijing IUFRO Tree Breeding Conference in 1998, noted that seed procurement was still, in the wake of the 21st century, more often than not the responsibility of administrative and clerical rather than technical staff in plantation programmes— and, thus, seed purchase was still in the late 1990s frequently based on the cheapest bid (Midgley 1999, 1999a).

Both Jacobs in 1961, and Midgley in 1999, stressed that seed cost constituted a minute proportion of that of forest plantation establishment: from 0.1 to just over 3%. Jacobs noted, pointedly, in his 1961 presentation: “There is no purpose in any country purchasing eucalypt seed to a certain value unless funds are available at a rate of at least one hundred times that value [for plantation establishment and management]”. The FAO slogan from the 1950s: “Good Seed Does Not Cost, It Pays”, was re-launched, first in a 1989 IUFRO meeting in Queensland, and subsequently forcefully stressed by the Australian Tree Seed Centre in its publicity campaigns in the 1990s (Anon 2002e,f). A complementing principle, stressed to national governments and donor agencies alike over the years by both CSIRO and FAO, is that seed-related work deserves strong investment in local technical and administrative skills; the managers of seed are, in fact, managing a very valuable resource.

My own message, over the past 30 years, has been that any seedlot moving within or outside of national borders without documentation on origin, provenance and genetic and physiological quality, must be disqualified from use and -without fail or exception- coldly discarded. I have stressed that the frequently expressed opinion, “any seed is better than no seed at all”, could not be more misguided, outright wrong and potentially of great and irreversible harm to our genetic patrimony (Palmberg-Lerche 1993a,1999). Needless to say, seed records must follow through from nursery to plantation, and be maintained throughout the life of the plantation- as stressed already in the 1st World Consultation on Forest Tree Breeding in 1963 (FAO 1963,1964). There are still today many sins committed against this rule, in many or most countries in the world.

The need to safeguard local genepools against pollution from hybridising, outside sources of pollen, has gone hand in hand with such messages. Unfortunately, as evidenced in the writings of Tulstrup, mentioned above, the case seems to have been lost for many species in much of Europe.
Millar and Libby, in noting an almost total lack of understanding of the risks and potential losses related to the contamination of local gene pools by pollen from introduced genetic materials, have called the unqualified calls for use of “native species”, a “Disneyland Fantasy” (Millar and Libby 1989).

There is an urgent need for major actors, including prestigious establishments such as the European Community and the Convention on Biological Diversity, to heed established scientific and technical principles related to movement of forest germplasm and conservation which take into consideration the need to safeguard local gene pools, and to discontinue incentives and correct regulations which may negatively affect such principles.

AUSTRALIAN TREE SEED CENTRE: EARLY DAYS AND DEVELOPMENT OVER THE YEARS

In 1957, the 9th Session of the FAO Conference noted that the extensive use of high-quality seed of improved varieties in agriculture was, “one of the most generally and most economically applicable measures for increasing productivity” (FAO 1957). The launching by FAO of the year 1961 as the “World Seed Year”, within the framework of the Freedom from Hunger Campaign, aimed to vigorously raise awareness of this principle throughout the world. In this campaign, and in all documentation and in the many events related to it, it was officially recognized that an important element in any strategy to ease and fight hunger and malnutrition in the world related strongly also to the production and use of better forest tree seed and to increased efforts in forest genetics and tree improvement (FAO 1959, 1959a; Anon 1960).

Within the framework of the World Seed Year, FAO Member Governments were called upon to initiate or intensify, “programs for the production and distribution of high quality seeds through a suitable national authority”. “The Eucalyptus Clearing House”, was established in 1962 by the Forestry and Timber Bureau of Australia in support of these calls for action (FAO 1961, 1963, 1964).

The original mandate of the Eucalyptus Clearing House was to, (i) assemble and disseminate technical information on Eucalyptus species most suitable for wood production and for sheltering field and food crops; (ii) assist in the procurement of certified seeds of Eucalyptus species suitable for use in countries outside of Australia; and (iii) conduct research on the genetics of Eucalyptus and in tree breeding for improved varieties. It was stressed that all of these activities would also benefit Australian growers and the Australian forest industry, both directly and indirectly, through information gathered from other countries which would complement and help expand the knowledge base in Australia. The United Nations, and more specifically FAO, was recognized as the proper coordinating agent for the work at international level (FAO 1961; Jacobs 1961).

Dr. Max Jacobs, in a paper prepared for the Second Eucalyptus Conference in Brazil in 1961, noted that the Forestry and Timber Bureau would not be the sole provider of seed and information, but would work in close collaboration with the State Forest Services, Universities and other appropriate Australian institutions. In addition to being a decision in principle, this was in fact a necessity: seed collection in Australia at the time was routinely done in connection with commercial felling and, therefore, there was a need to ensure that seed crops were available in areas being felled, synchronizing timing of felling and seed collection. Jacobs, further, noted that it was hoped to gradually improve arrangements also for the collection of seed of non-commercial eucalypts desired in other countries. However, he warned that orders may take a considerable time to fulfil, seed would be expensive, and it would likely only be possible to supply very small quantities of seed, which should be used by introducing countries for the establishment of seed production areas to satisfy additional needs (Jacobs 1961).
It is interesting to note that, from the outset, it was stressed that Australian seedlots should be sold at cost or commercial price, in acknowledgement of the considerable costs involved in arranging and ensuring the supply of seed of good quality. It was noted that only if those receiving seed were obliged to pay for it, would they fully understand the value of this important commodity and treat it with the care it deserved. It was repeatedly stressed, echoing the recommendations of many sessions of the FAO Panel of Experts on Forest Gene Resources, that countries seriously interested in eucalypts should develop their own seed sources of all major exotic species and provenances in use, soonest possible (FAO 1968-2002).

Commencing in 1962, the Forestry and Timber Bureau routinely provided a leaflet on seed handling with each seed order, hoping thus to help prevent wasteful use of seed and enable limited supplies to assist more countries. These leaflets, subsequently, grew into useful, massive reference books, used throughout the world. The publication of two magnum opuses, “Growing trees on Australian farms” (Brown 1968); and “The use of trees and shrubs in the dry country of Australia” (Hall et al. 1972), provided the knowledge basis for more intensive use of eucalypts also in Australia; yet, it would take many years before action in the country caught up with the scale of eucalypt planting in other countries.


Activities related to seed certification were also energetically discussed, however, progress was slow and continues to be less than adequate even today in many countries. A forest seed certificate form was adopted as early as 1951 by the FAO Conference. Some further elaborated forms and related guidance, were later published as an annex to the FAO Handbook, “Handling Forest Tree Seed” (FAO 1955), and in Unasylva (Morandini 1961). Matthews, who reviewed progress in forest tree seed certification in 30 countries in a paper presented at the First World Consultation on Forest Tree Breeding in 1963, noted that, in spite of the obvious advantages to both suppliers and purchasers, only a handful of countries, and only Mexico in the developing world, had adopted forest tree seed certification. He noted that the effectiveness of implementation of such schemes depended on efficient but flexible and functional supervision and inspection of seed imports and exports, which at the time was largely lacking (FAO 1963; Matthews 1963). This brings, to me, visions of today’s situation, in spite of efforts such as e.g. the organization of a IUFRO coordinated meeting in the subject in 1992 (KEFRI/GTZ/IUFRO 1992). In the late 1960s, the potential of other Australian tree genera, in addition to eucalypts, was increasingly recognised. With the encouragement of the FAO Panel of Experts on Forest Gene Resources, the charter of what had become known as the Australian Tree Seed Centre (ATSC), was expanded to include other native genera of woody plants, both trees and shrubs (Drielsma et al. 1997; Anon 2002e,f). At the same time the demand for eucalypt seed continued to increase sharply. The 4th Session of the FAO Forest Gene Panel, in 1977, “noted the large demand for seed of eucalypts in certain of countries, notably Brazil, which was importing many tons of seed each year, not only from Australia, but also from countries in Africa in which eucalypts were grown as exotics” (FAO 1968-2002). Political pressure behind the large Brazilian tree planting programme, which was supported by vigorous fiscal incentives, was massive, and this, at times, led to some policy level friction related to (physical) availability and cost of seed.

The ATSC’s collection of tree seed has grown over the years to include a wide range of multipurpose trees of Australian origin (Vercoe and Midgley 1993). In 1998 the Centre was reported to hold about 30 000 accessions comprising 1 200 species, from several thousand collection sites (Midgley 1999).
Eucalypts made up about one half of the species in the collections, while other genera represented included *Acacia*, *Casuarina*, *Grevillea*, *Melaleuca*, *Sesbania* and *Terminalia*. Most accessions came from natural populations but the Centre was also establishing and managing an expanding network of seed orchards, as had been originally foreseen in the 1950s. The Centre responded to over 2 500 requests per year, about half of which came from countries outside of Australia. With support from the ATSC, base populations for breeding purposes had also been established in other countries for *E. globulus*, *E. nitens*, *E. grandis*, *E. pellita*, *Acacia mangium*, *A. auriculiformis*, *A. crassicaarpa* and many other species (Anon 1988, 2002f).

Overall, according to records, a total of more than 250 000 seedlots have been despatched to growers in Australia and to over 150 countries throughout the world. Seed collection and despatch have continued to be core functions of the ATSC, along with the provision of information about the woody component of Australia’s plant biological diversity; research on genetic diversity; and training, as recommended already by the 1st World Consultation on Forest Tree Breeding in Stockholm in 1963 (Anon 2002e,f).

The ATSC presently maintains a useful and widely consulted database of field trials of Australian species. Growth data from these trials are stored in the “TREDAT” centralised performance register, linking growth measurements to site, management and seedlot origin (Anon 2002f). Following early work by FAO expert Lamberto Golfari and his team in Brazil in the 1970s, in which bioclimatic maps were prepared to support species introductions (Golfari et al.1978), work has been pursued in CSIRO by Trevor Booth and colleagues to map regions climatically suitable for Australian tree species at the global scale, using new, computerized methods of climatic analysis (Booth 1991). This work is of great help to countries in the testing of species and provenances for future use.

The ATSC, which originally was attached to the Forest Research Institute of the Australian Forestry and Timber Bureau, became part of the Division of Forest Research of the CSIRO in 1975. With this move the Seed Section of the new Division continued its traditional exploration and seed collection activities.

Its stated aims were, “to provide a seed supply service, with particular emphasis on Australian tree seeds for research, and to act as the national seed coordinating centre for Australia” (Anon 2002f).

In 1983, following several periods of short-term funding from the Australian bilateral aid agency, AIDAB, for collecting and distributing seed for specific purposes in bilateral programme countries, AIDAB - later AusAID- commenced the Seeds of Australian Trees Project (SAT), managed by the ATSC. The project aimed to facilitate seed distribution to developing countries collaborating in Australian bilateral programmes (Anon 1988). The SAT Project, and other projects financed by AusAID and ACIAR, soon became a main focus and the core of the international part of the work of the ATSC, and only limited collections were made to replenish general seed stocks (Drielsma et al. 1997).

Priorities shifted also on the international scene. Since the establishment of the FAO Panel of Experts on Forest Gene Resources in 1968, the contributions made towards seed collection and distribution from FAO’s Regular Programme in the biennium 1968-1969, included support to two national institutes, one of which was Australia; in the “golden years”, between 1985 and 1995, such support was provided by FAO to between 15 and 25 institutes. These institutes gradually included a growing number of partners in developing countries, and such traditional Australian seed collection partners as Papua New Guinea and Indonesia. In the second part of the 1990s, support to seed collection and distribution for experimental purposes and conservation, gave way to other priorities. Added emphasis was being placed on the testing, use and development of local species in developing countries; this grossly increased the number of species actually or potentially included in genetic management programmes, and – by necessity - implied a shift to providing support to developing countries in prioritizing target species and genetic resource activities at national, sub-regional and regional levels as a basic, fundamental, first step in such an effort. Prior to such a shift, the list of priority species pin-pointed for attention had symptomatically grown from 4 pages –in large font- in the Report on the First Session of the Panel of Experts on Forest Gene Resources, in 1986, to a daunting 70, tightly printed pages, in the Report on the 6th Session, in 1985 (FAO 1968-2002). FAO and CSIRO, subsequently, joined forces in supporting regional forest genetic resources workshops to help countries prioritize species and activities, and to draw up coherent action programmes,
such as the one prepared in a workshop held in April 1999 by countries in the South Pacific (Sigaud et al.
1999; FAO 2001f).

Added attention to the use of local tree species was also evident in Australia, the traditional “Radiata Pine Country”, and support to Australian growers in the use of Australian species, has been over the past years increasingly stressed in the work programme of the ATSC. Recent activities have included, i.a. contractual work undertaken by the ATSC for Sydney Water, involving collection, storage and testing of seed of a range of species for re-vegetation work, from trees to grasses. The ATSC has, accordingly, expanded its species coverage and know-how to include also non-woody species (Anon 2002f). In 1996, the Federal Government of Australia and the Australian industry, adopted a plan for trebling the Australian forest plantation resource to 3 million hectares by 2020, implying an increase in annual planting rate from 25 000 ha/an, to 80 000 ha/an (“The 2020 Vision”). Much of this new plantation resource will be based on Australian tree species, and strong support from the CSIRO and the ATSC is both a necessity and an expectation (Drielsma et al. 1997; Anon 2002f; Vercoe and Clarke 2002).

In addition to geographical and species shifts, there has been over the past years, increasing emphasis on the business nature of the ATSC. While the Seed Centre, for some time already, has had to “earn its own living” through grants programmes, projects and commercial scale seed sales, recent moves by decision makers in Australia and at the CSIRO are aimed to make an overall, significant corporate shift from a “CSIRO Research Institute” to “CSIRO Research Enterprise”, under the slogan, “Forestry is a Global Business”. The underlying philosophy is that, in order to deliver outcomes for Australia, the CSIRO, the Division of Forestry and Forest Products, and the ATSC, need to be positioned as “global players”, with focus on “strategic partnerships and operational efficiency” (Anon 2002f). Less philanthropy, more business, in tune with today’s world?

GAINS FROM GETTING IT RIGHT

The regional timber trend studies published by FAO demonstrated, already in 1963, a trend towards a coming, greatly increased demand for forest products as a result of rapid increases in population and rising standards of living (Lanly and Allen 1991). Accordingly, the global forest plantation estate increased from 17.8 million hectares in 1980 and 43.6 million hectares in 1990 and to 187 million hectares in 2000. Of these, 39%, 36% and 48% in 1980, 1990 and 2000, respectively, were established for industrial wood production. According to the global forest resources assessment 2000, forest plantations presently account for 5% of global forest cover and for less than 3% of the industrial forest plantation estate. However, in the year 2000 forest plantations were estimated to supply about 35% of global roundwood (FAO 1982, 1993, 2002, 2002b; Carle et al. 2002).

Provision of wood from natural forests, notably those in the tropics, is frequently not competitive, nor sustainable, in the long term. In many tropical countries there is therefore a rapid transition from natural to plantation forests for productive purposes. Plantation yields are often orders of magnitude higher than those of natural forests; for example, in Brazil, the mean annual increment expected for natural tropical forests is 0.5 m$^3$–5 m$^3$/ha/an, as compared to 35, 45, or up to 75 m$^3$/ha/an in intensively managed plantations. In this country, plantations filled more than 70% of the national industrial roundwood needs in 1997, in spite of the fact that the natural forest area covered over 360 million hectares and plantation forests just 4.5 million hectares (Anon 2002d, FAO 2002b).

Other factors will also tip the balance in favour of plantations for wood production: the economies of scale based on location, and managerial and harvesting advantages of much higher concentrations of wood volume per unit area, increase enormously the relative financial efficiency of plantations. Moreover, and importantly over the last few years, forest plantations, while still needing to be managed in an environmentally sensitive manner, as noted by Leslie in a recent ITTO discussion paper prepared for the Global Environmental Facility, in many countries “bear less of the environmental burden” than natural forests, provided that they do not cause, “an undue reduction in biodiversity values” (Anon 2002d).
In establishing forest plantations, the choice of species and provenance, and their accurate matching to site and end use requirements, are essential for success. The need to do so is even more pronounced when non-native tree species are used, which often is the case in developing countries and in the tropics (FAO 1958, 1958a; Mergen 1959).

The practical importance of systematic testing has been convincingly demonstrated. The international provenance trials of *Eucalyptus camaldulensis*, coordinated by FAO in the 1960s, were among the first of a number of such trials. At FAO, these went under the working name, “Operation Camal”. Experiments were established on 32 sites in 18 countries, and they showed that the potential gains in growth and yield which could be achieved by selection of the best-adapted provenances for prevailing environmental conditions, amounted to several hundred percent, with differences in growth between provenances ranging from 300% in northern Nigeria, to 800% in Israel (FAO 1977, 1979; Lacaze 1979). Spectacular provenance differences were also found in dry-zone *Acacia* and *Prosopis* species and provenances in a series of FAO coordinated trials in the 1980s and 1990s (FAO 1980; Palmberg 1981; Palmberg-Lerche 1993a, 1999).

In China, yields, following species and provenance selection and the introduction of better silvicultural methods, more than doubled; and rotation times decreased by 30%. In spite of increased costs of plantation establishment and management, the mean internal rate of return in the plantation schemes reviewed, using a 5% discount rate, was 35% (McKenney 1998). In the case of *Acacia mangium*, the productivity of large-scale plantations in Indonesia was doubled by use of better adapted provenances, as compared to yields obtained using as a starting point the relatively poor quality seed previously used. These stands were also of better quality in regard to stem straightness and branching (Midgley 1999).

A recent study of 45 reforestation projects in the tropics found that 95% of these were based on introduced species. Sixty percent of the projects carried out species trials in parallel with the reforestation activities. About 60% of these, in turn, gained additional information during the life span of the project which resulted in a change of species, and many more were incentivated to change the provenances originally used. Needless to say, timely species and provenance testing would have constituted a major economic saving in these cases (FAO 2002e).

**INTERNATIONAL ACTION AND TRENDS**

Discussions on plant genetic resources within FAO were first begun in 1948. Over the more than 50 years of FAO’s existence, perceptions of global needs and priorities have greatly changed, and programmes and priorities have shifted, accordingly.

Annex 1 attempts to capture some of these changes in focus and areas of priority in forest genetic resources work, through documenting new and emerging issues and key points raised and discussed in the sessions of the FAO Panel of Experts on Forest Gene Resources, from 1968 to 2001 (FAO 1968-2002).

In 1961, FAO established a Panel of Experts on Plant Exploration and Introduction; the Panel of Experts on Forest Gene Resources was established in 1968. The first professional post dealing with forest genetic resources was created in the FAO’s Forestry Department in 1974. IBPGR, now the International Plant Genetic Resources Institute, IPGRI, was established in 1974 as a semi-autonomous unit within FAO, with the purpose of focusing action on research related aspects of genetic resource management, largely, but not exclusively, in crop plants. Four international technical conferences on plant genetic resources were convened by FAO, in 1967, 1973 and 1981 and 1996; while the main focus of these conferences was food crops, forest genetic resources were also included in discussions (Palmberg and Esquinas 1990).

In 1983, the 22nd Session of FAO Conference adopted a legally non-binding, *International Undertaking on Plant Genetic Resources*, and established a *Commission on Plant Genetic Resources* to oversee and guide related activities. The International Undertaking was created to support a multilateral system of facilitated access and benefit-sharing for the world’s key crops.
The legally binding, *International Treaty on Plant Genetic Resources for Food and Agriculture*, was adopted by the FAO Conference in November 2001, after many long years of discussions and negotiations. Central in this Treaty are, "the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security" (Articles 5 and 6). The Treaty covers all plant genetic resources for food and agriculture and thus, in principle, according to FAO terminology, also forest genetic resources. One of the components of the Treaty is a, *Multilateral System for Access and Benefit Sharing*. The Multilateral System covers a relatively small number of, mainly, food crop species, listed in an Annex to the Treaty. The Treaty will enter into force following ratification by 40 countries (Fresco 2001; FAO 2002a).

The Convention on Biological Diversity, CBD, was established following the UNCED Congress in Rio de Janeiro in 1992 and entered into force the following year. The CBD focuses on the conservation of biological diversity and the equitable sharing of benefits from the use of its components. It calls on Parties to create conditions to facilitate access to genetic resources. While the Convention itself makes no specific reference to forests and forestry, the Sixth Meeting of the Conference of the Parties (COP-6) to the CBD, in April 2002, agreed on an expanded work programme on forest biological diversity, including conservation, sustainable use and benefit sharing; the promotion of institutional and socio-economic enabling environment; and knowledge management, assessment and monitoring. The task of priority setting and action in carrying out the work programme, lies with signatory nations (Laird 2001; Le-Danff and Sigaud 2001; Anon 2002b).

The UNCED-Rio Declaration on Environment and Development of 1992 contains 27 principles on sustainable development, including many referring to, or relevant for, diversity and genetic resources of forests and forest species. Agreements related to the *Precautionary Principle; Biosafety*—used in the *Cartagena Protocol* in reference to the release and transboundary movement of Living Modified Organisms; ‘Advance Informed Agreement’; and *Biosecurity* or *Bioprotection*, which refer to the policy and regulatory frameworks to manage environmental and biological risks; and yet others, have led to a situation in which Governments require effective, improved and up-dated international frameworks and standards to support national action and to help underpin national and international monitoring and reporting (see e.g. Foster et al. 2000; O’Riordan et al. 2001; FAO 2002c). As investments involving both infrastructure and human resources to develop and implement regulatory frameworks are high, the challenge is to generate more consistency across sectors for added efficiency and cost effectiveness (Anon 2001b; Stannard 2002). Australia is, reportedly, signatory to some 20 international conventions, treaties, mechanisms and agreements of some relevance to forestry, in addition to having specific legislation and acts governing national issues, such as indigenous peoples’ rights. There are some 75 Acts or laws in the country affecting access to biological resources (Anon 1994, 1996).

At the end of this month, in South Africa, the so-called “Rio+10” –summit will be held, officially known as the UN World Summit for Sustainable Development, WSSD. The outcome of this Summit is not known at the time of preparing the present paper.
TRADE, ACCESS

In relation to access to genetic resources, all countries are highly inter-dependent. Australia is among the countries with the highest degree of dependency, estimated at between 88% and 100% for the 20 most important crops grown in the country. In relation to forest genetic resources, exotic tree species will continue to play an important role in Australia, and international exchange of forest genetic resources will continue to be fundamental to breeding and sustained production.

Agriculture and forestry have always been based on access and exchange, not on exclusivity; seed has, from time-immemorial, moved along the routes of trade, war and love. International trade and exchange of germplasm of Australian tree species, as mentioned before, has been pursued for over 200 years. Forestry has, over the years, enjoyed a tradition of good will among international collaborators, based on such a history of institution-to-institution connections and scientist-to-scientist contacts. Save some exceptions related to species providing for example foliar oils: *Eucalyptus polybrachtea* in the 1950s, and more recent, largely self-imposed regulations regarding *Melaleuca alternifolia*, there are currently very few restrictions on the export of forest tree seed from Australia, or any other countries, provided that plant health and availability of material of the required quality in the required quantity, are adequately catered for (Anon 1994, 1996; Drielsma *et al.* 1997; Midgley 1999a).

Forestry, and the issues related to forest genetic resources are, however, becoming part of a larger international debate on use and benefit sharing. There are many different policies and regulatory approaches which relate to the ownership and use of biological resources in Australia, where the States have responsibility for management of forests and where the collection of seed from native forests is controlled by State and Territory land management agencies. Emerging social, policy and legal issues will likely increasingly influence the access to, and exchange of, Australian forest genetic resources in the future (Anon 2002).

The range-wide provenance collections of *Eucalyptus camaldulensis*, “Operation Camal”, was referred to earlier in this paper. One could mention, as an example, that to gain access today to a comprehensive collection of provenances of *Eucalyptus camaldulensis*, like the one collected and distributed in the 1960s, would require official permits from more than 15 agencies and organisations in six States and Territories, and additional permits from several indigenous communities and other private landowners (Midgley 1999, 1999a).

In the case of the ATSC, the *Material Transfer Agreement* presently accompanying all seed dispatches, requests users to abide by a number of basic requirements (Anon 2002a). The MTA will likely in the future dynamically change in response to new requirements and legislation. In recent Government led discussions regarding access to Australian genetic resources, it was stressed that Australia will control access to indigenous biological resources in accordance with the provisions of the CBD, and that international access to such resources may be granted on the basis that the contracting parties recognize Australia’s rights of ownership of the genetic material collected; involvement in research on biological material of Australian origin; and fair and equitable returns on, and proportionate ownership of, commercial products developed from Australian biological resources. It was, further, noted that the Commonwealth and State Governments reserve the right to set fees or royalties, or affect other charges relating to the granting of access to Australia’s genetic resources; and to receive all data, materials and reports of research relating to the commercial potential of those resources (Anon 1994, 1996; Voumard 2000).

SCIENCE: INFLUENCE AND TRENDS

A coming era of “*Revolutionary research breakthroughs*”, was predicted already in the World Tree Breeding Consultations in 1963 and 1969 (FAO 1964, 1970). They were a reality in the Consultations in 1977 and 1998 (FAO 1979; Matyas 1999).

While providing opportunities for advance, all new technologies bring new risks. Furthermore, no scientific findings will work magic on their own. Success in their deployment requires both careful identification of needs, and opportunities to link new findings with existing technological, social and
environmental packages (see e.g. FAO 2000, 2001c; Anon 2001, 2001c; Fresco 2001, 2001a; Visser 2001; Dargie 2002; Stannard 2002).

Development of biotechnological and molecular tools has risen to the forefront of science over the past years. Advances made are paralleled only by those in information technologies. Advantage must be taken of the exciting new opportunities these new technologies offer. If applied with intelligence, they will improve the precision and facilitate the work of the tree breeder of the future. However, while it is important to apply sophisticated techniques that can put the finishing touches on advanced varieties, at least as much effort must go to ensuring the development of the basic breeding populations. Findings in biotechnologies can only be capitalized if sound tree improvement programmes are in place within which the new technologies can be applied (Palmberg-Lerche 1999, 2002).

Furthermore, breeding always implies a commitment to greater domestication. Domestication implies good husbandry which, in forestry, means the application of improved techniques for plantation establishment and natural forest and plantation silviculture and management. Without concurrent improvement and application of these, and attention to logistics such as access and diffusion of better seeds to the users, breeding efforts, as well as investments in biotechnological research, will be wasted (Libby 2001; FAO 2002b).

In recent Sessions, the FAO Panel of Experts on Forest Gene Resources noted with concern the widening gap between science and practice, and stressed that successful application was at risk if knowledge produced at scientific level was more advanced than what the operational level was able to absorb and implement. A major constraint in the use of new biotechnological tools in forestry was, at present, the lack of skilled tree breeders able to understand and utilise the information generated by scientists and to ensure its application in practical, large-scale programmes. Inadequacy of funding for field level activities further hampered progress (FAO 1968-2002; see esp. 11th and 12th Sessions, 1999, 2001).

The Forest Gene Panel also noted that problems arose when sophisticated techniques were applied to underdeveloped genotypes, and when efforts were focused on advanced techniques without due attention to development of the basic breeding resource (Namkoong 2002; Namkoong et al. 2002).

Appropriate allocation of resources to biotechnology, classical breeding and field activities, will not of itself ensure the right outcome, but it is a crucial prerequisite for it. The clear message is that the adoption of biotechnological tools must be part of a substantially increased commitment to genetic improvement and to forestry in general, rather than a switch of effort away from classical breeding and silviculture. Efforts must, in other words, be additive, rather than imply a replacement or substitution of one kind of activity with another (Burdon 1994; Namkoong 2001).

Furthermore, the gap in mutual understanding is widening in the presently on-going international policy dialogue, between “the international forest policy jet-setters” on the one hand; and on the other, the managers of forestry programmes at various levels, in National Forest Departments and forestry institutions. Field level, practical foresters are still further removed from high-level decisions and commitments made in international fora, however they are expected to implement, monitor and report upon field and follow-up action. The increasingly multi-disciplinary nature of today’s forest policy dialogue, in which a range of political and environmental concerns are super-imposed on forest policies, frequently dominating the outcome, tends to further alienate the conceptual and practical levels.
In this scenario, the attraction of further isolating science from practice is a big temptation, as in so doing, the complex issues of needs, feedback, implementation and links with other fields related to forestry, can be left aside, as somebody else’s problem. The glamour surrounding cutting-edge science (Fresco 2001) and dreams of major profit opportunities, can easily distort research priorities, drawing investment away from traditional fields and field level application, without which, however, science is a blind alley.

The statements of a powerful private company executive, who participated in a recent discussion forum on biotechnologies in plant breeding, were truly amazing. He noted that, “competition from conventional breeding poses a barrier to attracting funding and support for new biotechnologies”. This, according to him, was due to the fact that, “most breeding programmes are now in only their second or third generations and, therefore, traditional methods can still yield sizable gains” (Anon 2002c). He thus implied that the fact that traditional plant breeding could yield “sizable gains”, was indeed lamentable! Underlying these statements was the fact, also discussed in the forum, that getting a GM crop or plant variety on the market would cost in excess of $US 30 million, to which regulatory costs added a further $US 5-6 million; while developing new varieties using traditional plant breeding methods, would cost only a fraction of this (Fresco 2001a). The question, then, was: was investment in unknown technologies really necessary, if selection and breeding, coupled with good resource management, could make major advances?

Reviewing presently used new biotechnologies in forestry, the most useful application is in the field of molecular and genetic markers. The value of these tools, if used wisely, is unquestioned (Burdon 1994; Haines 1994; FAO 2001c; Namkoong 2001).

Regarding genetic engineering, while 60% of all processed foods in the USA are today genetically modified, including mostly products from soybeans, corn and canola (Fresco 2001a), no commercial plantations of GM trees have been established to date. However, according to records, genetic modification is under experimentation in some 25 species of poplar, eucalypt and pine. Techniques include recombinant DNA and asexual gene transfer and, most frequently, aim to introduce herbicide and pest resistance, or to reduce or modify the lignin content of wood (FAO 2001a, b).

As noted by the late Gene Namkoong in his retirement seminar last year, present assumptions underlying work in gene transfer, generally grossly under-estimate the complexity of genetic systems and physiological processes. Interactions are the paradigm for gene actions in forestry, and epistasis is strong and complex. According to Namkoong, general effects which might be defined for genes are not fixed or even estimable as approximations or as average and variable effects. In regard to the present debate on biotechnologies in forestry, he noted that it unfortunately reflected, “a mechanical view of the world, in which it is increasingly thought that moving around pieces will make all the difference”; and that it misleadingly publicised the potential of single gene effects and transgenic technologies, with the underlying assumption that “genes for growth”, or “genes for overall adaptation to harsh environments”, could be found. Namkoong dismissed this as, “pursuing a Phantom” (Namkoong 2001). Needless to say, strong genotype x environment interactions, which will influence all traits, old and new, over the long life-cycles of forest trees, will further (from Man’s point of view) complicate the matters when targeting so called “agronomic traits” in forestry.

Biotechnologies, which often today in public debate are equated with genetic modification, are in many countries distrusted by the public, which sees these techniques as "meddling with evolution", as part of negative aspects of globalization and privatization, and as "anti-democratic". GM technology in food crops is thought to further foster farmers’ dependence on biotechnology companies and reduce farmers’ autonomy and right to decide, thus touching upon basic food security issues. Uncertainty about safety for humans and the environment, and a lack of perceived benefits for consumers, have further limited general acceptance of the very idea of genetic modification. Questionable research and questionable science is unfortunately increasingly published even in some of the world’s leading scientific journals, and this has been quickly and selectively picked up by other parts of the media, further firing the debate.
Consequences include at times restrictive legislation, based on what my fisheries colleague Devin Bartley called, “policy makers’ perception of public perception” (Bartley 2002). Hopefully, in the future, the human fear driving such moves will, instead, lead us to good science-based risk assessment and good science which is perceived to, and does, benefit all groups of society.

CONCLUDING REMARKS: PAST AND FUTURE OF THE ATSC

The ATSC makes a unique Australian contribution to national and international efforts in the conservation and wise use of forest genetic resources and, in so doing, conforms to the mission and objectives of the CSIRO and fulfils the ATSC’s stated aim of “exploring, domesticating and conserving Australian forest genetic resources”.

The quality of science undertaken has been consistently of a high order, as recognised in 1994 by the award to the ATSC of the CSIRO Medal for Excellence in Science; and the many other rewards, honours and international tokens of acknowledgement afforded CSIRO and Seed Centre staff over the years.

From the 1940s to today, Australian expertise, experience and goodwill have been drawn upon in international circles, and international action has benefited from the work of great men, such as Max Jacobs, Lindsay Pryor and others. Through participation in the work of the FAO Panel of Experts on Forest Gene Resources ever since its establishment in 1968, experts from the Australian Forestry and Timber Bureau, CSIRO and ATSC, have also more formally contributed to forest genetic resources discussions at international level. Such international contacts have, in turn, influenced the programme and focus of the Australian Tree Seed Centre and the institutions that have hosted it over the years.

Priorities at international level, reflected in the work of the ATSC, have changed from early focus on seed collection and geneecological studies underpinning species and provenance research of a few major Australian timber species used in plantation forestry in the 1960s and early 1970s, to collection and management of genetic resources of a range of native Australian trees and shrubs for a great number of purposes and end uses. Such a shift, due largely to changes in the perception of the place and role of forests and trees in national development, was accompanied by increased attention in all countries to native species which provided alternatives to introduced species and which, at times, were part of traditions and therefore more commonly accepted by local human populations for use and domestication.

The meetings of the FAO Panel of Experts on Forest Gene Resources clearly reflected such trends at international level through an exponential increase over the years in the number of species listed as being in need of attention. In the first meetings of the Panel in 1968 and 1969, some half a dozen species were prioritized for international action and support; in the 6th Session of the Panel, in 1985, the list of priority species had grown to cover 70 pages. Simultaneously, the prioritised activities shifted from collection and international seed exchange, to research, genetic studies and holistic gene management, including conservation in situ as part of comprehensive, sustainable natural resource management (FAO 1968-2002).

The above shifts led to a need for national priority setting among many alternative species and to recent increased attention, at international level, to providing support to developing countries in the preparation of sub-regional and regional action plans, in which priority species and activities, and sharing of operational responsibilities, are determined by countries concerned.

As institutions and expertise in developing countries were gradually strengthened, international action increasingly stressed institutional networking. CSIRO and the ATSC have, rightly, laid added stress over the years on building partnerships with developing country institutions, rather than just providing support to them; and on pursuing collaboration resulting in increased benefits to both parties.

A recent issue of the FAO Journal, Unasylva, went under the working name, “The Delphi Issue”, as like the Oracle of Delphi- it attempted to predict coming scenarios in forestry (FAO 2001e). While predictions especially in the field of science have proven difficult and generally have gone badly wrong in the past, humans, according to their nature, will always wish to look into the future. Some issues are predictable,
others are not. Expectations in science often outrun achievements, and seemingly promising strategies and methodologies are frequently replaced by developments which may have been beyond imagination before.

Without using a *Crystal Ball* - or intoxicating fumes like the Oracle of Delphi did- likely future scenarios and priorities in forest genetic resources work can to some degree be determined. Then, what is the likely future role in such developments of the ATSC?

Some focal areas of attention which have been proposed\textsuperscript{11} and which are supported are:

1. Further strengthen partnerships and strategic research links with Australian Government agencies, educational and research institutions, the private sector and non-governmental organizations. In addition to fostering overall operational efficiency, such cooperation will help underpin genetic conservation efforts to ensure that valuable seed sources are not lost; and facilitate taxonomic studies and the collection of provenance samples, with special reference to still little-known promising species (such as *e.g.* *Acacia crassicarpa*). Strengthened partnerships will also help enhance ATSC support to the realization of the Australian “2020 Vision”, and the related renewed interest in the use of Australian trees on-farm.

2. Help foster enhanced capacity in developing countries through training, institutional twinning and academic exchange programmes, noting that benefits from such support are mutual. As an example, breeding work can often be done at a faster pace and at lower cost in neighbouring countries, and may result in earlier availability of improved material both for Australia and for the country carrying out the work than would be the case with purely domestic research in either of them.

3. Catalyze and support networking and inter-institutional collaboration. Recognizing that high levels of adaptation and productivity are achieved only when the genetic and physiological potential of the genetic materials used are well matched with management practices, consideration should be given to possibilities to extend areas of collaboration to nursery practices, plantation establishment and silviculture.

4. Continue the international exchange of scientific knowledge of taxonomic variation, genetic improvement, silviculture and pest management of Australian species, much of which has been developed in other countries. Help extended and apply existing genetic knowledge, breeding theory and domestication strategies developed by or in collaboration with CSIRO, to non-Australian species, with special emphasis on species which have affinities to Australian taxa.

5. Vigorously promote active feedback systems between research and the field, and apply methods to ensure effective transfer of research results into practice. Develop methodologies for the monitoring of diffusion and use of high-quality reproductive materials as an integral part of tree breeding and planting programmes in Australia and in partner countries, promote their wide application and use.

6. Continue outreach in Australia and other countries through publications and information materials, targeting, respectively, policy makers, technical/scientific and popular levels.

7. Carry out studies and document financial and economic benefits of the use of quality seed as a basic step in domestication, and review ecological and social aspects of tree growing and domestication as a basis for lasting success.

8. Continue to be closely involved in national and international efforts related to the development and application of regulatory frameworks and legislation governing access and benefit sharing, biosafety and bioprotection, through:
   - Pursuing cooperation with Australian States, landowners and managers to facilitate access to domestic forest genetic resources on mutually agreed terms,
   - Promoting continued international availability and access to reproductive materials of Australian trees and shrubs on bilaterally or multilaterally agreed terms and conditions, through mechanisms such as Material Transfer Agreements, in the spirit of the Convention on Biological Diversity, the

\textsuperscript{11}See Drielsma *et al.* 1997; and information found in Anon.2002f.
International Treaty on Plant Genetic Resources for Food and Agriculture and other similar mechanisms. Success in the above will likely, in turn, help ensure continued access to vitally important introduced genetic resources on which Australia depends, and maintain and enhance existing goodwill which can be capitalised in joint ventures or in marketing of Australian skills and technology.

9. Develop policies for engagement in fair and transparent commercial activities, consistent with the CSIRO/ATSC research mission for public benefit as well as the increased emphasis on the business nature of the Seed Centre and the corresponding corporate shifts; ensure that the newly adapted CSIRO slogan, “Forestry is a Business”, transmits an unequivocally positive message at all levels.

Going back to the origins of the Australian Tree Seed Centre, and the focus on eucalypts, I would like to pose a final -rhetorical- question, in reflection of the one-sided environmental debate over the past decade related to “biodiversity”, in which the present state of nature is viewed as the ideal one, nature is intrinsically static, and human intervention is considered to be always negative: Are eucalypts, and other tree species grown widely, more, or less, variable today than 100 years ago?

Regarding the reoccurring issues of perceived negative environmental and social effects of eucalypts, let me state that to me, many eucalypt species can be categorized in the same way as the Goat in dryland ecosystems: ugly in the eyes of some people, but tough, versatile, invaluable and, in many cases and occasions, irreplaceable. There is nothing intrinsically wrong with the goat, nor with the eucalypts, or other fast-growing, widely-introduced or used pioneer tree species. The problem, when and if there is one, is in the management of these species by Man.

REFERENCES AND SOME MAJOR SOURCE MATERIALS USED

11. REGIONAL UPDATE FOR AUSTRALIA, NEW ZEALAND, PAPUA NEW GUINEA AND THE PACIFIC

Brown, A.G. (1968). Growing trees on Australian farms: the use of trees for ornament, shade, shelter and timber production in the coastal and tableland areas of temperate Australia, including planting in streets, roads, parks and reserves; together with a chapter on rural fire control. Commonwealth of Australia. Dept National Development, Forestry and Timber Bureau, Canberra.

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11. REGIONAL UPDATE FOR AUSTRALIA, NEW ZEALAND, PAPUA NEW GUINEA AND THE PACIFIC


ANNEX 1.

NEW AND EMERGING ISSUES, KEY CONCEPTS & FOCUS DISCUSSED IN SESSIONS OF THE FAO PANEL OF EXPERTS ON FOREST GENE RESOURCES 1968-2001

1968 (1st Session)
Focus on:
- Coordination of efforts, identification of priority species for international attention.
- Provenance collections, international species/provenance trials.
- Seed collection and handling guidelines.

1969 (2nd Session)
Focus on:
- Tropical tree species.
- Conservation in situ, ex situ.
- National seed certification schemes.
- Need for technical manuals and guides, equipment notes.

Panel noted that, all priority-1 species, listed in 1st Session of Panel in 1968, were expected to have been collected by the end of 1971.

1974 (3rd Session)
Focus on:
- Transfer of technologies and know-how.
- Monographs on individual species.

Panel noted that:
- Global Programme on Forest Genetic Resources had been developed and published, with a view to increasing support and efficiency and better coordinate action.
- FAO Forest Genetic Resources Newsbulletin started (1972); “Methodology of conservation” published (1975).
- Professional position in forest genetic resources created in FAO.
- In 1974, Committees had been set up in each Australian State to advice on needs and methods of conservation of forest genetic resources.

1977 (4th Session)
Focus on:
- Environmental benefits of forests.
- Training, capacity building.

Panel noted that, the Australian Forestry Council had appointed a sub-committee to prepare a statement on the status and methods of conservation of forest genetic resources.

1981 (5th Session)
Focus on:
- Social benefits of forests: food, fodder and energy.
- Policy level awareness.
- Incorporation of conservation in productive forest management.
- Ex situ conservation stands.

1985 (6th Session)
Focus on:
- Role of forests in environmental stabilization and improvement.
- Production of a range of forest goods and services compatible with conservation.
- Incorporation of conservation in forest and protected area management, and in tree breeding strategies.

Panel noted that, priority species for attention covered 70 pages in the Report on the Session.

11. REGIONAL UPDATE FOR AUSTRALIA, NEW ZEALAND, PAPUA NEW GUINEA AND THE PACIFIC

1989 (7th Session)
Focus on:
- Contribution of forests to sustainable development.
- Role of forests and woodlands in the conservation of other species of plants and animals.
- Active gene management.
- New biotechnologies.

1993 (8th Session)
Focus on:
- Environmental values of forests.
- Problems of deforestation, landscape fragmentation.
- Conservation and ethics.
- Need for partnerships, twinning, networking.
- Access and benefit sharing.
- Biotechnologies as supportive tools.
- Computer-based systems for information storage, retrieval and analysis.

Panel noted that:
- FAO International Undertaking on Plant Genetic Resources had been adopted and ratified.
- The Convention on Biological Diversity had been adopted and ratified
- The REFORGEN global information system on forest genetic resources was under development.

1995 (9th Session)
Focus on:
- Emergence of the criterion of biological diversity in sustainable forest management: defining, measuring, conserving, monitoring diversity.
- Problem of pollution of native gene pools.
- Widespread institutional turmoil, and the need for consistency in funding and effort.
- Safe movement of forest reproductive materials.

Panel noted that, the International Technical Conference on Plant Genetic Resources for Food and Agriculture.-“The Leipzig Conference on Plant genetic resources”- had been held.

1997 (10th Session)
Focus on:
- Role of forests in food security.
- Need for coordination between sectors and among increasing number of actors.
- Decentralization, privatization, institutional and macro-economic shifts.
- Innovative mechanisms for collaboration and funding support; national forest programmes.

Panel noted that, the 13th Session of COFO had recommended that FAO support regional forest genetic resources workshops and the development of regional/sub-regional action programmes.

1999 (11th Session)
Focus on:
- Need for strengthened partnerships with governments and national institutions, international, regional and bilateral organizations, NGOs, the private sector, communities.
- Sustainable resource use; compatibility conservation, use and genetic management.
- Importance of traditional methodologies as basis for advanced techniques.

2001 (12th Session)
Focus on:
- Work and complementarity of action with Conventions on biological diversity, climate change, desertification.
- Biological diversity, biotechnology, biosafety and bioprotection.
- Need for harmonization of concepts and terms.
- Role of fire, drought and other adverse environmental factors in breeding.
- Need for facilitation of exchange of reproductive materials on mutually agreed terms
- Role of trees grown outside the forest, agroforestry; desertification control, CO2 capture.
Need to adapt conventional and new genetic technologies to local species.
Need to bridge increasing gap between science and practice.
The Panel noted that:
- The International Treaty on Genetic Resources for Food and Agriculture had been approved in FAO Conference November 2001.
- An CBD Work Programme on Forest Biological Diversity had been approved by the 6th meeting of the Conference of the Parties.
List of species identified as high, global, regional and/or national priority.
Legend in Appendix 3

**MELANESIA**

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<td><strong>Agathis macrophylla</strong></td>
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<td><strong>Calophyllum spp</strong></td>
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<td><strong>Cordia subcordata</strong></td>
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<tr>
<td>Calophyllum inophyllum</td>
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<td>Calophyllum neo-neobudicum</td>
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<td>Cordia subcordata</td>
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<td>Intsia bijuga</td>
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<td>Planchonella samoensis</td>
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<td>Pometia pinnata</td>
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<td>Santalum spp.</td>
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<td>Syzygium inophylloides</td>
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<td>Terminalia richii</td>
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<td>Thespesia populnea</td>
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## MICRONESIA

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<td>Exploration &amp; collection</td>
<td>Evaluation</td>
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<td>Barringtonia asiatica</td>
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<tr>
<td>Calophyllum inophyllum</td>
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<td>Cordia subcordata</td>
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<td>Intsia bijuga</td>
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<td>Morinda citrifolia</td>
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<td>Pandanus tectorius</td>
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<td>Pisonia grandis</td>
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<tr>
<td>Thespesia populnea</td>
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<td>SPECIES</td>
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<tr>
<td>Agathis macrophylla (kauris)</td>
<td>X</td>
<td>Exploration &amp; collection</td>
<td>F, SI, V. Other priority species include A. labillardierii (PNG), A. lanceolata (NC), A. moorei (NC), A. ovata (NC), A. robusta spp nesophila (PNG), A. spathulata (PNG) and A. silbai (V)</td>
</tr>
<tr>
<td>Calophyllum euryphillum</td>
<td>X</td>
<td>Evaluation</td>
<td>Regionally priority species: C. inophyllum (F,NC,PNG,SI,V; beach tamanu, dilo), C. neoebudicum (PNG, SL,V; damanu), C. peekelii (PNG, SI, ba’ula). Nationally important species include C. caledonicum (NC, tamanu), C. cerasiferum (F, damanu) and C. vitiense (F, damanu).</td>
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<tr>
<td>Canarium indicum</td>
<td></td>
<td>Conservation Germplasm use</td>
<td>Very high priority in PNG and pacific region. Important community and export potential</td>
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<tr>
<td>Dracontomelon dao (PG walnut)</td>
<td>X</td>
<td>Evaluation</td>
<td>High value timber in PNG and edible fruit</td>
</tr>
<tr>
<td>Gyrinops ledermannii (Aquilaria eaglewood, gaharu, agarwood)</td>
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<td>Conservation Germplasm use</td>
<td>Resin impregnated wood highly valued for ceremonial, medicinal uses in Middle east, Japan etc. Major conservation and management concerns for species in Asia and PNG.</td>
</tr>
<tr>
<td>Intsia bijuga (Kwila)</td>
<td>X</td>
<td>Evaluation</td>
<td>Very high value durable export timber from PNG. Slow growing. F (vesi), NC, PNG (kwila), SI (u’ula), V (natora)</td>
</tr>
<tr>
<td>Pometia pinnata (Pacific lychee, Taun)</td>
<td>X</td>
<td>Evaluation</td>
<td>Is valued for both timber and fruit. Work currently in progress looking at provenance field tests in PNG</td>
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<tr>
<td>Pterocarpus indicus (NG Rosewood)</td>
<td>X</td>
<td>Evaluation</td>
<td></td>
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<tr>
<td>Santalum macgregorii (Sandalwood)</td>
<td>X</td>
<td>Evaluation</td>
<td>Vast majority of the species has been cut out from its natural distribution in PNG. Currently part of a project in PNG on conservation and management of the species,</td>
</tr>
<tr>
<td>Terminalia catappa</td>
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<td>Important nut varieties</td>
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### Papua New Guinea

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<th>Evaluation</th>
<th>Conservation</th>
<th>Germplasm use</th>
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<td><em>Aleurites moluccana</em></td>
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<td>Grows exceptionally fast when young. Good multipurpose species</td>
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<tr>
<td><em>Cordia subcordata</em> (kerosene wood)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>Slow growing, but good for coastal replanting</td>
</tr>
<tr>
<td><em>Diospyros ferrea</em> (ebony)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>High value wood for carving</td>
</tr>
<tr>
<td><em>Endospermum medullosum</em> (PNG basswood)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
# APPENDIX 1

## OUTLINE OF REGIONAL UPDATES USED AT THE 13TH SESSION OF THE PANEL OF EXPERTS ON FOREST GENE RESOURCES

<table>
<thead>
<tr>
<th>Section</th>
<th>Issues</th>
</tr>
</thead>
</table>
| **1/ Policy and Institutional Issues** | * institutions: new roles, responsibilities, capabilities, organization.  
* new legislation, policy, strategies on forest genetic resources  
* specific legal issues: access and property rights, MTAs  
* developments in forest management / ownership  
* links with other international action frameworks or agreements (national forest programmes, Convention on Biological Diversity; Agenda 21 of UNCED, notably work of the UN Forum on Forests; etc.) |
| **2/ Technical and Biological Issues** | * new FGR assessments, exploration, conservation programmes  
* research on new forest products (entailing sustainable management of the resources)  
* activities in germplasm supply, demand, procurement and exchange  
* developments in tree selection and improvement, field evaluation  
* threats to FGR, protection and conservation  
* advances in biotechnologies, incl. genetic modification |
| **3/ Operational and Organizational Issues** | * new developments in training, education, extension  
* information management and dissemination of information  
* activities in seed certification and registration  
* notes related to financial scenarios, sources of funding  
* development of regional and international cooperation |

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Annexes  
Useful references  
Any other information
APPENDIX 2: GENERAL OBSERVATIONS ON THE LISTS

IMPORTANT FOREST GENETIC RESOURCES
(BY REGION, SPECIES AND OPERATION)

SPECIES IDENTIFIED AS HIGH, GLOBAL, REGIONAL
AND/OR NATIONAL PRIORITY

The lists represent an attempt to provide lists of high priority forest tree species at regional, eco-regional or sub-regional level.

The lists do not present an exhaustive list of woody perennial species in need of attention. They aim at providing information on those species and provenances which the FAO Panel of Experts on Forest Gene Resources, during its 13th Session in November 2003, considered should be given high priority in the work programme of international, regional, bilateral and national institutions and agencies and the private sector.

The Panel of Experts recognized that many of the priority ratings must be considered tentative; the list will need continuing up-dating and must be modified in the light of new information, knowledge and needs.

These lists are based on the experts’ opinion. The diversity of forest types, status and condition, and the different types and scales of values used to rank forest tree species among countries and cultures, makes the establishment of objective, global guidelines, a difficult exercise. In their own capacity, and on the basis of their personal experience, experts have reviewed information from national and regional sources, and ranked those species which appeared to present high actual or potential value, at species or population level.

The lists focus on those tree species that have an actual or perceived importance at regional, eco-regional or sub-regional level. The lists do not systematically include species that may be important at national level only. There is therefore a need to supplement the list drawn up by the Panel with more detailed, country-based lists of priorities at local and national level.

These lists emphasize the importance of the genetic variation between species, and within species, and do not specifically target endangered or threatened species or populations because of their endangered condition. Similarly, although in exceptional cases referring to genera, they do not refer to ecosystems or biota.

Readers interested in endangered or threatened tree and shrub species may wish to refer to:

(i) the IUCN Red List of Threatened Species, at http://www.iucnredlist.org/
(iii) the World Conservation Monitoring Centre’s databases, available on the Internet at http://www.unep-wcmc.org/
APPENDIX 3: LEGEND OF THE SPECIES LISTS

"Main End Use of Species" (columns 1-4)

Column 1, "Industrial Wood": sawn logs, timber, heavy construction wood, plywood, chip and particle board, wood pulp.

Column 2, "Industrial Non-Wood Products": gums, resins, oils, tannins or other products used in small, medium and large-scale local and non-local industries.

Column 3, "Fuelwood, Posts, Poles": firewood and wood used for the production of charcoal and energy; roundwood used on-farm.

Column 4, "Other Uses (goods, services)": food, fodder, land stabilization, soil amelioration, shade, shelter and other environmental and cultural or religious values.

“Operations/Activities”

The list indicates priority on a scale from 1 to 3 for the various operational steps identified: exploration, evaluation, conservation and utilization of germplasm (including selection and breeding), as follows:

(1) Highest priority
(2) Prompt action recommended
(3) Action is important, but of less urgency than that for species listed as priority (1) and (2).

"Remarks" column

PVT = provenance trial
PGT = progeny trial
CLT = clonal trials
SO = seed orchard
(E) = endangered at species or provenance level
MPTS = multi purpose tree species