Obituary for Gene Namkoong

Professor Gene Namkoong, 68, passed away on Sunday March 3, 2002. He was a member of the Board of Trustees of the International Plant Genetic Resources Institute (IPGRI) since 1997, and served as Vice-Chairman from 2000/2001. Throughout his tenure on the Board, Gene made an outstanding contribution to IPGRI and in particular to the Forest Genetic Resources programme, which today reflects many of Gene’s ideas and thoughts on the conservation and use of forest genetic resources.

A native of New York of Korean ancestry, Dr. Namkoong received his Bachelor of Science degree in 1956 and his M.S. in 1958, both from the State University of New York at Syracuse. He received his Ph.D. from North Carolina State University in 1963, in forestry and quantitative genetics. He was hired and worked for the US Forest Service from 1958 to 1993, based at North Carolina State University, where he also held professorships in the Departments of Genetics, Biomathematics and Forestry. During those years, Gene advised several graduate students from the USA and abroad, and was always available to share his knowledge and wisdom. In the mid-1970’s he was awarded the rare distinction of being appointed as a Pioneer Research Scientist in the US Forest Service. In 1993, after retiring from the USFS, he became Head of the Department of Forest Sciences at the University of British Columbia, Canada. He served in that position until his retirement in July, 1999, when he and his wife Carol moved back to North Carolina.

It is difficult to encapsulate Gene Namkoong’s many and exceptional contributions to forest science and genetics. He ranked among the world’s leading authorities in forest genetics. He published in many areas, including theoretical and empirical population and quantitative genetics, breeding theory and strategies, gene conservation, extension, resistance breeding, and in conservation ethics. In recognition of his work, he was awarded the prestigious Marcus Wallenberg prize in 1994, for his “path-breaking contributions to quantitative and population genetics, tree breeding and management of genetic resources which form a solid scientific basis for the maintenance of biological diversity in forests all over the world.”

Other honours included an honorary degree from the Swedish Agricultural University, membership of the Royal Swedish Academy of Agriculture and Forestry, membership on the Korean Academy of Agriculture and Forestry, and membership of the FAO Panel of Experts on Forest Genetic Resources from December 1989 till 2001.

He was also elected to the Order on Honor/Camellia by the Republic of Korea, was a fellow of the American Association for the Advancement of Science (AAAS), and received the USDA Forest Service Superior Scientist Award in 1991. He served as a consultant and scientific advisor to DANIDA (Denmark), and to the DFID-funded Dendrogene Project of EMBRAPA in Brazil, serving a chairman of the Steering Committee. He also served on the technical advisory panel of CIFOR and IBPGR.

Retirement saw neither a reduction in Gene’s zest for learning, nor any slowing in his creativity. He fought a heroic battle with melanoma, and maintained a positive and philosophical view of life to the end, all the time continuing to work on his final book. He was greatly supported in this battle, as he was throughout his career, by Carol. We were all extremely fortunate to have known Gene as a colleague and a friend and to have had the opportunity to learn from his wisdom. Our lives have been touched by this truly remarkable man. He will be missed more than we can imagine.

Alvin Yanchuk, Weber Amaral
Focus

**Contribution of FAO to FGR activities**

FAO has been playing a major role on Forest Genetic Resources issues for more than three decades. An important landmark was the establishment of the Panel of Experts on Forest Genetic Resources in 1968, attending a request of the Fourteenth Session of the FAO Conference (1967). FAO has provided a fundamental contribution giving technical support to national institutes in member countries on issues related to forest genetic resources management, their conservation and sustainable use. It has also contributed to fostering joint activities between centers of the CGIAR, and promoted wide international cooperation, organizing workshops and meetings. FAO’s international collaboration with partners is also focused on the transfer of information, know-how and technologies, through a wide range of communication tools (publications, electronic means), and through networking and twinning mechanisms.

Particularly during the last 25 years, the work conducted at FAO on Forest Genetic Resources has always been associated with the competence, guidance and energy of Christel Palmberg-Lerche, who unfortunately for the FGR community is retiring at the end of 2002.

Some of FAO’s activities on various aspects of forest genetic resources are described below:

1. Collection, evaluation and assessment of genetic resources have been carried out in collaboration with national institutes and international organizations, such as the International Union of Forestry Research Organizations (IUFRO), relevant Centres of the Consultative Group on International Agricultural Research (Future Harvest Centres), and the Danida Forest Seed Centre, Denmark, focusing on socio-economically important species for the dry and humid tropics. The developments on international conservation programmes related to neotropical mahoganies, in particular in the framework of CITES, have been closely followed, and some support has been provided to activities in Central America/Mexico.

2. Conservation of genetic resources actively contributed to elaborating forest genetic resources conservation methodologies, through the evaluation in the field of *in situ* and *ex situ* conservation stands of native or introduced species. The experiences gained have also been synthesized and summarized in a series of technical guides to forest genetic resources conservation that FAO, the International Plant Genetic Resources Institute (IPGRI) and the Danida Forest Seed Centre are finalizing.

3. Information activities have developed further with the on-line opening of the World-Wide Information System on Forest Genetic Resources (REFORGEN). The database contains information provided by 146 countries, on over 1600 tree and shrub species. Information is increasingly complemented by data available in country reports prepared for regional assessments.

4. International collaboration - FAO works with IUFRO, Future Harvest (CGIAR) centres (notably IPGRI, the Centre for International Forestry Research (CIFOR) and the International Centre for Research in Agroforestry (ICRAF)), the CBD Secretariat, universities, national forest services and research institutes. In partnership with IPGRI, work has continued towards the development of technical guidelines for the safe movement of *Pinus* and *Acacia* germplasm. In 2000 and 2001, FAO assisted the CBD Secretariat in preparing a report documenting status and trends of forest biological diversity. FAO resource persons were also provided to meetings of the Ad-Hoc Technical Expert Group on Forest Biological Diversity, convened by the secretariat of the CBD, in preparation of meetings of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-7, November 2001) and the Conference of the Parties (COP-6, March 2002) which addressed forest biological diversity issues. As a fol-
low-up to recommendations made by the 13th Session of the Committee on Forestry (COFO) in 1997, FAO has been supporting the preparation of status assessment for forest genetic resources at national and regional levels. In collaboration with international, regional and national organizations, eco-regional workshops for the conservation, management and sustainable use of forest genetic resources have been convened in Sahelian Africa (1998), the South Pacific (1999), and Southern and Eastern Africa (SADC countries, in 2000). Similar workshops are planned in 2002 in Central Africa and in 2003 in Central America, with support from an FAO-Netherlands Partnership Programme.

Further information can be obtained from: Christel Palmberg-Lerche, Chief of Forest Resources Development Service, Forest Resources Division, FAO (christel.palmberg@fao.org) and Pierre Sigaud, Forestry Officer, Forest Genetic Resources, Forest Resources Division, FAO (pierre.sigaud@fao.org).

Impact of climate change on forest genetic resources

Climate change is an additional threat to plant genetic resources. Conservation efforts should be tailored in order to reduce the vulnerability of certain ecosystems and to perpetuate their functioning, ultimately securing the maintenance of food provision.

The major questions are “how” and “how fast” climate change is going to have impact on PGR, and “how” and “if” national programs and IPGRI’s collaborators should be part of the international scientific arena that is actively involved on this issue.

During the course of 2001, IPGRI got involved in the global effort to understand the repercussions of some major threats deriving from climate change. Thanks to the financial support provided by the Innovation Fund scheme, IPGRI has developed a project aimed to study the effects of increased CO₂ concentration on biodiversity of crops and forest species. The project proposal has contributed to finalize the links with analogous wider-scale initiatives, such as Global Challenge Programme on Climate Change carried out within the CGIAR, and to define the contribution expected from IPGRI within the frame of the inter-center activity on this topic.

The project had the specific objective to contribute to: 1) a better understanding of the effects of climate change on genetic diversity of crops (food security issues) and forest species (alternatives for CO₂ sequestration), and 2) the provision of sustainable mitigation alternatives to the increased levels of CO₂ in the atmosphere, with reference to developing countries.

The successful evaluation of the project has enabled IPGRI to hire a consultant, Michele Bozzano, who has been working on the elaboration of appropriate strategies for the conservation and sustainable use of FGR within the context of a changing human and natural environment. Three major outcomes were produced: I) a project proposal to be submitted to donors; II) a theme draft contribution to the ICWG on Climate Change, and III) a literature database Web accessible on climate change and biodiversity.

The project is not an isolated activity but is in the stream of a series of initiatives taking place in several countries, and addressing the emerging need to understand the potential effect of climate change on vegetation structure and dynamics. Several are the studies carried out from a physiological and ecological perspective, whereas there is a general lack of information on the repercussions of climate instability at the
genetic level, especially for what concerns tropical tree species. For most tropical species, not only is the dynamic picture missing but also the static snapshot of ecological requirements, distribution range, distribution patterns, and genetic structure of different populations within the same species.

Unusual drought and variation in rainfall are increasingly recognized as important in tropical forests (Condit 1998; Condit, Hubbell and Foster 1995; Condit, Hubbell and Foster 1996a; Condit, Hubbell and Foster 1996b; Williamson, Laurance, Oliveira, Delamonica et al. 2000; Condit, Hubbell and Foster 1996a). Little is known on how the composition of a tropical forest changes when precipitation patterns shift. Wetter or drier-than-average years in humid tropical forests may not have serious repercussions on natural communities. However, a few dry years in a row could be detrimental to many populations (Hartshorn 1992).

The species-specific information necessary to make predictions on the impact of future climate scenarios is not often available. There are scattered examples of studies that looked at species geographic distribution relative to precipitation patterns and predicted shifts in forest composition as a consequence of longer dry seasons. As an example, Condit estimated variable percentages of extinction according to different forecast extensions of the dry season (25% and 40% of the species would be locally eliminated, after a four-week and nine-week extension respectively) (Condit 1998). Actual population changes have been detected distinguishing between species with different ecological range, deduced from the topographic position occupied (Condit, Hubbell, and Foster 1996a).

Presently, it is not known whether ecosystem stability increases with: a) the number of species, b) the kinds of species, c) the number of functional groups represented by the species, d) the kinds of functional groups represented by the species. For tropical forest ecosystems, much less is known on the genetic diversity whose preservation is the ultimate goal of any conservation effort and whose richness would secure an adequate level of plasticity with respect to wide-scale perturbation such as high climate variability. For sustainability of forest management, conservation of genetic diversity is an essential component for three main reasons (Brown et al., 2000). These reasons are: (a) maintain short-term viability of individuals and populations, (b) maintain the evolutionary potential of populations and species, and (c) provide opportunities of use of genetic resources.

Considerable efforts have been put in the determination of functional guilds of species. The general purpose of developing functional classifications is to find some generally applicable simplification of diversity of life, retaining information about the most important processes and interactions (Botkin 1975).

A significant driving force for developing such classifications has been the need to develop models of regional and global systems for predicting the impacts and feedback of global change (Woodward, Smith and Shugart 1997).

There is interest from other areas, such as conservation ecology, as functional ecology is seen to be important when making decisions about the viability of conservation areas (Pressey, Humphries, Margules, Vanewright et al. 1993). Defining one set of plant functional types for all purposes and scales of operation is not possible, nor necessarily desirable. Functional traits are likely to vary with the function of interest and are context specific (Gitay and Noble 1997).

Functional classifications have been used to achieve a range of specific outcomes: broad-scale models of global vegetation (Prentice, Cramer, Harrison, Leemans et al. 1992; Woodward 1987); schemes describing functional responses of a regional flora to environmental factors (Grime, Hodgson and Hunt 1988); and schemes addressing specific disturbances (Lavorel, McIntyre, Landsberg and Forbes 1997; Noble and Gitay 1996).

Ecological and genetic diversity studies, climate studies that incorporate vegetation feedbacks, functional grouping elaborations, and other theoretical and practical analyses, are based on fundamental information such as species ecological range, biology, distribution patterns. Many stakeholders would benefit by a
wide-scale operation of data collection and collation. Floristic inventories and ecological information on single species, especially those with a crucial role in the livelihood of local communities, contain vital information for the rational utilization of these species, for the improvement of plantations, and the management and conservation of natural communities. Basic information on managed and unmanaged forest ecosystems in tropical areas is either missing or too scattered to enable the drawing of a more global picture and to extrapolate common patterns. What is missing is a concerted action whose outputs would be beneficial to several stakeholders. IPGRI could take part in this networking initiative as it could capitalize on a wide experience in collaborative efforts with several partners, aimed to promote conservation of forest genetic resources and the management and conservation of natural communities. Programs for conservation and management of forest genetic resources are more likely to be effective if conducted at a regional scale. Networking and information sharing through common initiatives would enable to optimise the use of available resources and spread the benefits among several partners. It would enable to avoid duplication of efforts and increase the benefits, it would promote interaction between different stakeholders, different sectors at the national and international level, it would strengthen collaboration between scientists, managers, policy-makers and users.

Genetic studies could turn out to be too expensive to be carried out in some circumstances. Therefore, there is the need to define sets of suitable indicators that could work as proxies and help monitoring the erosion of genetic diversity. The indicators are based on species ecological and demographic traits. Many institutions are involved with the definition of appropriate indicators and the refinement of modelling exercises that have the objective to assess the impact of management (and more extensively the impact of climate instability) on genetic diversity. All these studies need to be validated by looking at species ecological range and distribution patterns, proving once more how basic knowledge extracted from forest inventories represents the most valuable piece of information that serves many purposes. It is the starting point for different types of investigations and it becomes really valuable if many partners join in a collective endeavour to gather information already available, enabling the extrapolation of regional and global trends in maintenance and erosion of genetic diversity, the extrapolation of wider-scale scenarios, the elucidation of general mechanisms that regulate and maintain biodiversity.

More information available from Dr. Weber Amaral, Senior Scientist, FGR Project, IPGRI (w.amaral@cgiar.org).

**LITERATURE CITED**


**Decision strategies on priorities for conservation and use of FGR**

**The Dendrogene Project: an approach to evidence-based policy formulation for the conservation and management of forest genetic resources**

To facilitate the sustainable management of forests, policies must be based on a sound understanding of the ecological and genetic functioning of forests, and the degree to which humans depend on and impact upon them. This requires a holistic and highly integrated approach to scientific investigation, which manages to establish effective collaboration among disciplines directed towards a common question. Moreover, broad stakeholder participation, to truly represent the wishes, needs and roles of local actors and the commercial sector, is essential if policies are to work.

IPGRI is already involved in the implementation of a research project in collaboration with the Instituto de Manejo e Certificação Florestal e Agrícola (IMAFLORA) in Brazil, to undertake a study on criteria and indicators for the monitoring and evaluation of genetic sustainability of forest management practices. IMAFLORA team is also involved with small-scale forest management programs, working with local communities in the Brazilian and Peruvian Amazon. This project supported by IPGRI is focused mainly on genetic indicators but it stems from another wider initiative conducted in the Amazon Basin, the Dendrogene project, which sees IPGRI’s participation within the Steering Committee.

Embrapa Amazônia Oriental implements the Dendrogene Project (2000-2004) (www.cpatu.embrapa.br/dendro/index.htm) in partnership with a network of interested institutions and projects. It is supported by DFID under the Brazil-UK cooperation programme. The strategy features the development of a tool (a forest simulation model) to analyse the environmental sustainability of alternative scenarios of forest use, and on providing skills and tools to enable knowledge-based management systems to be applied in practice (see figure).

One of the principal constraints in the Amazon is the limited capacity to correctly identify tree species. The project is developing and testing identification sheets for more than fifty of the major commercial species and identification booklets for five of...
appropriate criteria and indicators for ecological and genetic sustainability of forest management.

The Dendrogene project impact goes beyond conservation of genetic resources as forest resources play an important role in the livelihoods of the region’s populations. At a broader level the influence of the forest on the environment and the interrelations between the environment and human development e.g. loss of forest leading to micro-scale temperature change impacting on disease incidence, stresses the need for the integration of knowledge of the social, economic and environmental impacts in development and conservation decision-making.

Current knowledge on the ecology and genetics of commercial tree species is being compiled, in co-operation with other projects and institutes, in a central database (Dendrobase). Long-term silvicultural study data are used to model forest dynamics. Detailed investigations focus on seven model species with distinct ecological characteristics. Studies on a 500 hectare plot concentrate on ecological and genetic structure and processes two years before and after timber harvesting including phenology; pollen vectors and dispersal; seed production, dispersal and germination; gene flow (to be assessed using micro-satellite markers being developed by the project); and seedling survival and growth. The genetic structure of some of the same species will be studied in another one thousand hectare plot in a different forest. Tree sample sizes for each species are 200-400 for genetic inventory of adults, 30 trees for seed genetic analysis and 60 trees for detailed phenology observation. These data are used to develop and validate a model (Ecogene-Symfor) that predicts genetic impacts and future forest development following interventions. Species characteristics stored in the Dendrobase can be used to assign model input parameters for species other than the model species.

The model will be used to simulate the impact on genetic diversity of alternative management scenarios in order to inform the formulation of appropriate policies and regulations. One specific area will be in testing appropriate criteria and indicators for ecological and genetic sustainability of forest management.

The Dendrogene project impact goes beyond conservation of genetic resources as forest resources play an important role in the livelihoods of the region’s populations. At a broader level the influence of the forest on the environment and the interrelations between the environment and human development e.g. loss of forest leading to micro-scale temperature change impacting on disease incidence, stresses the need for the integration of knowledge of the social, economic and environmental impacts in development and conservation decision-making.
Locating genetic diversity in forest ecosystems

Assessing genetic diversity of *Pterocarpus macrocarpus* in Vietnam

*Pterocarpus macrocarpus* Kurz is one of the major commercial timber species of the mainland Southeast Asia where its natural distribution range covers Cambodia, Laos, Myanmar, Thailand and Vietnam. In Thailand, for example, it was the second most valuable timber species after teak in terms of export earnings prior to the logging ban for natural forests which was imposed in 1989. Despite its economic value, the species is not yet under extensive plantation programmes and the remaining natural stands are diminishing.

For a long time *P. macrocarpus* was overlooked by researchers and its ecological and biological characteristics remained poorly understood. In recent years, however, it has received more national and regional attention. The ASEAN Forest Tree Seed Centre (AFTSC) in Thailand has conducted considerable amount of research on the reproductive biology and genetics of *P. macrocarpus*. AFTSC also compiled and published a monograph on *P. macrocarpus* in 1999 together with the Centre for International Forestry Research (CIFOR).

In Vietnam, *P. macrocarpus* is considered as an endangered species and it is included into the ‘Vietnam Red Book’ of species for conservation. Over the past years, scientists at the Research Centre for Forest Tree Improvement (RCFTI) of the Forest Science Institute of Vietnam have been conducting studies on important timber species in the country, including *P. macrocarpus*, in collaboration with IPGRI. This work focused on locating the remaining populations of these timber species and assessing their natural regeneration.
LOCATING GENETIC DIVERSITY

capability while also conducting socio-economic surveys and evaluating land use changes in selected locations (see last issue of the IPGRI FGR Research Highlights).
The recent phase of the research activities is focused on assessing genetic diversity of *P. macrocarpus* populations in Vietnam to obtain information for conservation and tree improvement purposes. The results are also valuable for regional conservation efforts as the located genetic diversity can be compared with similar studies already carried out in Thailand. RCFTI scientists conducted field surveys in four locations in Vietnam, i.e. in Yokdon National Park (Buondon District, Daklak Province), Easo National Conservation Area (Eacar District, Daklak Province), Dau Tieng Protection Forest Area (Tau Chau District, Tay Ninh Province) and Ky Son Forest Enterprise (Nghe An Province).

For each population, 20 mother trees were chosen and seeds were collected for genetic studies. The seeds were sowed in a nursery to produce plant material for laboratory work on the genetic diversity applying the isozyme technique. Final results of this research project will be available soon for developing the conservation strategy for *P. macrocarpus* in Vietnam and other Southeast Asian countries. Further information on this project can be obtained from Prof. Le Dinh Kha and Dr. Nguyen Huy Son at Research Centre for Forest Tree Improvement, Hanoi, Vietnam (rcfti@netnam.org.vn).

Pod of *Pterocarpus macrocarpus* (Vietnam)

Ex situ conservation stand of *Pterocarpus macrocarpus* (Thailand)
Continuing efforts towards the conservation and sustainable use of FGR in Syria and Lebanon

Considerable progress has been made in Syria and Lebanon since 1998 when IPGRI started to increase awareness on conservation and sustainable use of forest genetic resources. In both countries, priority species have been selected and a research framework has been developed for ecogeographic surveys and studies on genetic diversity and socio-economic issues of the target species. Three national ecogeographic surveys have been carried out on *Pinus brutia* (Syria), *Pistacia atlantica* (Syria) and *Ceratonia siliqua* (Lebanon). Results of these surveys include spatial data on the populations and GIS based climate and soil data layers, which have been compiled on a CD-ROM. Molecular characterisation of the three target species is carried out at ICARDA and at the American University of Beirut (AUB). Final results of the genetic diversity study of *Pinus brutia* and *Ceratonia siliqua* will be available soon.

In this update, results of a M.Sc. study on the characterisation of *Pinus pinea* forests in Lebanon are presented. Furthermore, a summary on the progress of the socio-economic study on *Pistacia atlantica* in Syria is given. This research can be considered in many ways the first of its kind in Syria. Finally, some experiences on tracing geo-referenced trees in Syria using GPS are also presented.

**Characterising Pinus pinea in Lebanon**

The stone pine (*Pinus pinea*), which is well known for its valuable nuts, is a typical Mediterranean forest tree. As a result of its long-continued cultivation and man-assisted distribution throughout the region, the exact origin of *P. pinea* is not known. In Lebanon, for instance, there is an ongoing controversy whether the species is truly indigenous or introduced. During the civil war *P. pinea* forests were seriously damaged in Lebanon. Recently, these forests are threatened by urbanisation, frequent forest fires and poor forest management practices. In 1998, an IPGRI-supported M.Sc. study was initiated at AUB to characterise diversity and record the management practices of *P. pinea* stands in Lebanon. Ten representative forest sites in Mount Lebanon have been surveyed for 15 traits related to habitat and cone/nut production. Complementary ecological and management data were also obtained. The species diversity showed a negative correlation with
the occurrence of fires and management practices. An analysis of the morphological traits of *P. pinus* trees showed high variability between and within the sites. However, clear correlation between these traits and environmental or ecological factors were not found. A second phase of this project was recently started and it aims at characterising the surveyed populations at molecular level.

**Socio-economic survey of Pistacia atlantica in Syria**

*Pistacia atlantica* is one of the four wild relatives of pistachio (*P. vera*) occurring in Syria. *P. atlantica* is an important rootstock for the cultivated pistachio varieties owing to its drought and disease resistance. In the past, vast areas were covered with *P. atlantica*, especially in the steep mountains of Jabl Balaas and Jabl Rudjmain. At present, the forests in these areas are highly degraded and fragmented. Overexploitation, expansion of agriculture and overgrazing are the main causes of this deterioration.

In November 2000, the University of Aleppo and IPGRI started a collaborative socio-economic survey to assess the use patterns of *P. atlantica* in Syria. This work also promotes the cooperation between forest experts and local communities. Three distinct study areas have been surveyed. In Jabl al Arab, the sites with of *P. atlantica* are highly fragmented and confined to the edges of private agricultural lands. The fragmented *P. atlantica* site in Jabl al Balaas is a national forest reserve surrounded by mainly semi-permanent settlements, in which sheep husbandry is the main source of income. Jabl Rudjmain is also declared as a national *P. atlantica* forest reserve. However, various nomadic tribes, which enter the area during winter, consider this region as an important rangeland for their sheep. Differences in perception and in use of *P. atlantica* among forest officials and local communities were also observed during the Rapid Rural Appraisal inventory. The National Forestry Department is mainly concerned with the protection of *P. atlantica* and its habitats whereas the utilisation of *P. atlantica* resources is a significant source of income for the local communities and farmers. For example, one kilogram of *P. atlantica* seeds is sold for the equivalent of 0.6 - 1 US dollar in local markets. The wood of *P. atlantica* is also highly appreciated as a source of fuel as well as for manufacturing the typical Arab mortars. Final results of this work will assist foresters and environmentalists to develop better guidelines for the conservation and use of *P. atlantica* forests in Syria.

**Locating trees with the use of GPS**

In Syria and Lebanon, the GPS-based forest surveys is a relatively new technique, which has been introduced by IPGRI during the ecogeographic surveys described above. Forest technicians have been trained to map the borders of forest sites using GPS and to record the positions of individual trees. In April 2001, scientists from the Syrian National Forestry Department and IPGRI tested a specific GPS-based technique in several areas of Syria. The aim was to trace back the position of previously surveyed trees, which were recorded using GPS. The method proved to be very useful as only 15 of the 236 previously recorded trees could not be located with precision. In these cases we observed that trees were either missing or more trees were present at the identified location. The following recommendations can improve the use of GPS to locate individual trees:

1) Take the point-coordinates as close as possible to the center of the target tree. This will reduce problems with clustered trees if the location needs to be traced back in future surveys. The target tree should of course also be marked with paint or labels.

2) GPS can also be used to assess the minimum distance between the sampled trees. This is particularly useful in hilly or mountainous areas, where it is often complicated to determine the distance between two points.

These experiences are derived from forest areas with a low tree density (< 100 trees/ha) and further testing is needed well the technique can be applied in forests with higher densities.

More information on these activities can be obtained from: Mr. T.O.M. Bazuin, Associate Scientist, Forest Genetic Resources, IPGRI-CWANA, Aleppo – Syria (t.bazuin@cgiar.org)
A significant amount of information on bamboo and rattan genetic resources and their conservation have been generated, compiled and distributed through IPGRI’s activities on these two resources since 1993 (Rao and Rao 1995, Rao and Rao 1997, Rao and Rao 1999). Results from a number of bamboo and rattan research activities have benefited the countries concerned and have also improved national capacity to address the conservation of these genetic resources (Sastrapradja et al. 2000 and Xu et al. 2000). The work accomplished so far in various countries with funding from the Japanese government has contributed to maximising the utilisation of the species and also to enhance their conservation and sustainable management. There are still gaps in information in areas such as distribution, population status, extent of genetic diversity, for example, that would hinder effective conservation of these resources in many countries. Thus IPGRI’s partners in the different Asian countries are continuing to work on diverse aspects of bamboo and rattan genetic resources.

The areas of focus have been grouped under four headings and have been obtained through consultations and workshops held with countries in the Asia-Pacific region to identify the knowledge gaps that exist and research that are needed for effective conservation of the genetic resources. These are:

(I) Assessing and inventorying – In situ conservation actions are required and will take priority while complimentary conservation strategies are being developed for the bamboo and rattan resources. Therefore the assessment of the current status of bamboo and rattan resources is a vital activity for successful in situ (and ex situ) conservation efforts. Activities to be undertaken under this area will include assessment and inventories, distribution patterns and size of populations, rates of extraction etc.

(II) Development and implementation of conservation procedures - There is a need to implement different procedures for conservation to ensure sustainable management of the bamboo and rattan genetic resources for use. This will include development of in situ and ex situ conservation plans, assessment of seed viability and seed storage and in vitro conservation protocols, establishment and management of field genebanks and guidelines for safe movement of germplasm.

(III) Rates of extraction and human impact – The long-term detrimental impact of over-exploitation on natural bamboo and rattan resources is obvious in several countries. There is still a lack of information on natural regeneration and on the socioeconomic impact of exploitation and conservation. This information is needed to establish proper in situ (and ex situ) measures, for sustainable utilisation of the resources to ensure that socioeconomic benefits are maintained.

(IV) Development of methods for sustainable conservation and use - It must be recognised that many
rural poor people are dependent on non-wood forest products such as bamboo and rattan. Efforts to conserve should not interfere with extraction and use of these resources for daily needs as well as for the income generation activities of these people and other forest dwellers. Understanding the preference for extraction by the forest and forest-fringe dwellers, especially when alternative means of livelihood become available is of significance to sustainable conservation of bamboo and rattan in the natural habitats. Activities would include assessment of economic gains through extraction of rattan, identification and selection of bamboo and rattan materials that perform well under different environments and ecosystems, and identification and selection of species suitable for cultivation to reduce pressure on naturally occurring stands.

In view of the wide range of distribution, use and inter-specific diversity, one of the tasks has been to develop widely applicable methodologies to study bamboo and rattan species from the biological aspects to the use perspectives in relation to genetic diversity and conservation. In other words, the results of the work could be applicable to other areas and species despite working in selected countries and with few species. This could be applicable by transferring the information for an application to a larger scale while trying to understand the overall “picture” of the conservation and use of bamboo and rattan species.

Currently, 10 projects are being undertaken with partners in eight countries in the Asia-Pacific region. These are listed in the table below with a summary of the expected outputs. The progress of these projects has been reported earlier and the next issue of FGR research highlights will provide details of those that will have been completed. In addition, 20 projects have been completed earlier. The results of the completed projects have been disseminated through workshops and seminars or made available through publications.
Table 1. On-going bamboo and rattan projects

**BAMBOO**

<table>
<thead>
<tr>
<th>Project</th>
<th>Collaborating organization/country</th>
<th>Outputs expected</th>
</tr>
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<tbody>
<tr>
<td>Collection of native bamboo species to establish a community genepool in central Yunnan, China (1999-2001)</td>
<td>Kunming Institute of Botany, CAS, Kunming, China</td>
<td>To establish an <em>ex situ</em> collection of valuable native bamboo species for conservation.</td>
</tr>
<tr>
<td>Genetic diversity and sustainable development of bamboo resources in Xishuangbanna, Yunnan Province, Southwest China (2000-2002)</td>
<td>Kunming Institute of Botany, CAS, Kunming, China</td>
<td>Data on genetic diversity of bamboo and guidelines for managing and developing the resource sustainably.</td>
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</tbody>
</table>

**RATTAN**

<table>
<thead>
<tr>
<th>Project</th>
<th>Collaborating organization/country</th>
<th>Outputs expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution, population status and genetic diversity of <em>Calamus manan</em> in Sumatra (2001)</td>
<td>Indonesian Institute of Sciences, Research and Development Centre for Biotechnology, Bogor, Indonesia</td>
<td>Data on population status, genetic diversity and taxonomic identity of the commercially valuable rattan “manau”.</td>
</tr>
</tbody>
</table>

**BAMBOO AND RATTAN**

<table>
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<tr>
<th>Project</th>
<th>Collaborating organization/country</th>
<th>Outputs expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapping genetic diversity of bamboo and rattans in Western Ghats of India (1998-2001)</td>
<td>University of Agricultural Sciences, Bangalore, India</td>
<td>Information on distribution and genetic diversity of rattans in Western Ghats.</td>
</tr>
</tbody>
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**Publications produced on project activities**


For additional information, please contact Mr. Hong L.T. (l.hong@cgiar.org), Bamboo and Rattan and FGR specialist or Dr. Ramantha Rao (v.rao@cgiar.org), Senior Scientist at IPGRI Regional Office for Asia, the Pacific and Oceania in Serdang, Malaysia.

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**Literature cited**


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Rattan regeneration in Southeast Asia
Are small forest fragments genetically more heterogeneous than large fragments? An analysis using the shola forest fragments in the Western Ghats, India

One of the classical treatments of equilibrium states in “islands” was offered by MacArthur and Wilson (1967) in their theory of island biogeography. They showed that islands of a given size attain equilibrium with respect to the number of species they can harbour and argued that this could have important implications for the conservation of forest fragments. A major lacuna of the theory, however, was that it did not offer any predictions on the composition of the species in the islands during the process of attaining equilibrium. Thus two islands of a given size could have the same numbers of species but entirely different species composition. Ganeshaiah et al. (1997) offered a simple but powerful theory to suggest a relation between the equilibrium states and island size with respect to the species composition in islands. They showed that, based on all possible combinations of species an island can theoretically harbour, species assemblages of small islands would be more diverse among themselves than would the large islands be. Test of these predictions have since been offered by studies from two fairly long-lived fragments, the sacred groves or “temple forests” and the high altitude valley forests, the

Recently, we have attempted to extend the proposition of Ganeshaiah et al. (1997) to the evolution of genetic states of population in forest fragments. That is what has been predicted for assemblages of species could be true for that of genes as well. Because just as a set of co-adapted species are selected in one island, a set of co-adapted genes in a species could be selected in an island. Accordingly, we predict that the small fragments among themselves would be more dissimilar in the genetic configurations than would a set of large fragments be.

We tested this prediction using the shola forests that exist as “natural” fragments in the upper reaches of the evergreen forests along the Western
Ghats. Though the origin of these forests is enigmatic, it is believed that they are geological in origin. The forests are rich in Lauraceae members and are set as “islands” in a “sea” of grass (see figure). The study was carried out on *Litsea floribunda* (Lauraceae), a moderate sized tree which is a predominant member of the shola vegetation. RAPD-PCR products for 10 random primers were scored for 32 individuals of *L. floribunda* from four small (0.15 ha) and medium (0.15-1 ha) size sholas and 27 individuals from three large sholas (>1 ha). The amplified products were scored as present (=1) and absent (=0).

Based on the data on the presence and absence of the amplified products, similarity index between all pairs of individuals for a given size class of shola was computed and the mean similarity index compared across different size class of sholas. Results indicate a significantly lower similarity index for the amplified products among the small (mean = 0.658 ± 0.067) as compared to the large sholas (mean = 0.694 ± 0.064; p<0.001). The coefficient of variation for the similarity indices decreased with the increase in size of the fragments. Further, the range in the similarity indices was wider for small and medium sized shola when compared to the large sholas. The frequency distribution of the similarity indices was significantly different for the small and large shola (Fig 2). There was also a significantly greater frequency of similarity indices at higher range in the large shola fragments as compared to the small sholas (KS test, p<0.001). In other words, the small sholas were more dissimilar to each other than were the large sholas among themselves.

These results suggest that the populations in the small fragments may have evolved independently after they were colonised by a founder population over the years and in such populations during the process of evolution, certain alleles and genes may have become co-adapted and hence persisted. As opposed to the larger fragments, where there is presumably a greater probability of random exchange of alleles, in small fragments such complexes could have been conserved due to restricted gene exchange. Thus, smaller populations over time may have become more diverse among themselves than would a set of large islands.

In other words, large sholas seem to converge towards a common equilibrium state showing higher similarity among themselves when compared to the smaller fragments. Thus, the results suggest that the smaller fragments though individually may not be as diverse as compared to the large fragments, which together add substantially to the genetic heterogeneity of the species. These results have important implications for the conservation of genetic diversity of populations of species in fragmented landscapes.

Further information on this study can be obtained from Dr. R. Uma Shaank er and Dr. K.N. Ganeshiah at the Departments of Crop Physiology, Genetics and Plant Breeding, University of Agricultural Sciences, Bangalore, India (atree@vsnl.com).

**Developing in situ conservation strategies for Dipterocarps**

Products from Dipterocarp forests provide substantial revenues for many Asian countries, especially in Southeast Asia. At local level their importance is also considerable; lowland tropical rainforests, commonly dominated by dipterocarps, host a huge array of biodiversity and support the livelihood of rural people in numerous ways. However, conservation strategies for dipterocarp species are lacking in many countries despite their economic importance. Several institutions have been conducting research on dipterocarps and their genetic resources in the Asia Pacific region but the major factor constraining progress has been the lack of coordinated action with well-defined objectives and priorities (Bawa 1998).

The family Dipterocarpaceae comprises 155 species in Peninsular Malaysia (Ashton 1982). In the past, dipterocarp conservation was not considered an important issue as the family was seen as common and none of the species were presumably threatened. However, a recent study by Saw and Sam (2000) indicates that over 57% of dipterocarp species have distribution patterns restricted to specific zones. There are also 30 species that are endemic to Peninsular Malaysia and out of these, 12 species are considered rare. Integrated planning and implementation efforts for *in situ* conservation, using information on genetic diversity and ecological characteristics, are needed to ensure long-term survival of rare and endangered dipterocarp species as well as other, more common species.
GENETICS AND ECOLOGY OF *SHOREA LUMUTENSIS* IN PENINSULAR MALAYSIA

The genus *Shorea* consists of about 194 species of which 18 are found in Peninsular Malaysia (Soerianegara and Lemmens 1994). *S. lumutensis* is a medium to large size tree with bole exceeding 100 cm in diameter. In timber trade, it is classified as ‘balau’ or heavy hardwood and it is suitable for different forms of heavy constructional work as well as various applications in houses, for example. Earlier, it was rather common in its restricted distribution area on coastal hills in the western Peninsular Malaysia but nowadays it has become rare.

Tree species with narrow habitat specificity and limited seed dispersal, like *S. lumutensis*, are at particular risk for genetic erosion and even global extinction as anthropogenic activities are modifying landscapes into mosaics. Genetic diversity is especially important for these species that usually have small and isolated populations even before the disturbances take place. Many rare or endemic species have been found to be genetically depauperate (Hamrick and Godt 1989). Explanations of low genetic diversity in rare species have entreated effects of recent evolutionary origin (Ashton and Abbott 1992), genetic drift (Barrett and Kohn 1991), genetic bottlenecks (Godt et al. 1995) and mating systems that promote inbreeding (Hamrick and Godt 1989). However, some rare or endemic species have displayed unexpected high levels of genetic diversity (e.g., Lewis and Crawford 1995). In Peninsular Malaysia, high levels of genetic diversity have been reported for commonly found Dipterocarp species, such as *Shorea leprosula* (Lee et al. 2000a) and *Dryobalanops aromatica* (Lee et al. 2000b), but no genetic diversity studies have been conducted for less common or rare Dipterocarp species.

In 2001, the Forest Research Institute Malaysia (FRIM) and IPGRI initiated a study on *S. lumutensis* to obtain more ecological data, to determine the amount of genetic diversity displayed by the species and to describe how genetic diversity is distributed within and among populations. The study also aims at determining the spatial genetic structure of *S. lumutensis* within a natural stand and estimating direct gene flow and breeding unit area for *in situ* conservation of the species.

The distribution of *S. lumutensis* is reported to be restricted to Dinding District in the state of Perak in Peninsular Malaysia and thus a field survey was conducted there within the Virgin Jungle Reserves (VJR) of five forest reserves (Lumut, Segari Melintang, Tanjung Hantu, Pangkor Utara, Sungai Pinang and Pangkor Selatan). The species could only be found in Lumut and Sungai Pinang Forest Reserves and within these forest reserves, *S. lumutensis* formed small patches within a general matrix of coastal hill dipterocarp forest, usually at elevations more than 100 m above sea level. Occasionally, isolated individuals were also seen elsewhere.

FRIM has established an 8-ha permanent sample plot at the Sungai Pinang Forest Reserve and recorded all *S. lumutensis* trees larger than 1 cm at dbh. A total of 416 individuals were found and visual observation of their spatial distribution suggests that the individuals occur clustered into six groups within the sample plot. Statistical analyses are underway to assess the validity of this observation.

A small number of trees were found in the medium size class (dbh 5 – 20 cm) in contrary to earlier studies with more common dipterocarp species (e.g., *Shorea curtissii*, *S. macroptera*, *S. acuminata* and *Neobalanocarpus heimii*) in hill dipterocarp forests where all species have shown equal distribution of individuals in medium and large size classes. A high number of seedlings, on the other hand, suggest that selfing is common in *S. lumutensis* as inbred seedlings do not appear to survive for a sufficient period of time to reach maturity. To analyse spatial genetic diversity, FRIM scientists have collected samples from trees in different size classes for DNA extraction and subsequent laboratory analyses are underway using microsatellites.

*For additional information, please contact Dr Lee Soong-Leong, Research Officer, FRIM (leesl@frim.gov.my) or Dr Jarkko Koskela, Associate Scientist, IPGRI Regional Office, Serdang, Malaysia (j.koskela@cgiar.org).*
Restoration of genetic diversity in Swietenia macrophylla in Costa Rica

Tropical dry forests are considered as the most threatened of the major tropical forest types (Janzen 1988). In Central America, only about 1% of the original land area covered by dry forest exists and Costa Rica is not an exception (Janzen 1988, Sader and Joyce 1988, Maas 1996, Sanchez 1996, Kramer 1997). In Costa Rica, most tropical dry forests were replaced with grasslands for cattle raising between 1940 and 1975 (Costa Rica 1950, 1973, Leon et al. 1982, Maas 1996). Typically, the pastures were established using Hyparrhenia rufa (Jaragua grass), which was introduced from Africa. This fire-tolerant grass allowed cattle ranchers to maintain their pasture by burning the fields during the long dry seasons. However, after abandonment of pastures due to the low prices of beef on the international market, seasonal burning of grassland is one of the major threats for the preservation and restoration of the tropical dry forests.

Fire is frequently cited as the most important factor controlling the dynamics of succession in the tropical dry forests (Janzen 1988). Typically, fires start by the combustion of highly flammable fire-tolerant Jaragua grass and extend into forested areas (Janzen 1986). The main consequences of these seasonal fires are: 1) the destruction of existing forest patches, 2) the modification of the edaphic and aerial microclimate necessary for site recovery, and 3) the suppression of regeneration due to fire-induced mortality of seedlings and saplings (Janzen 1986). Thus it is important to prevent fires to ensure further plant succession and subsequent site recovery.

Few studies have examined early plant succession in abandoned pastures fields in tropical regions (Uhl et al. 1981, Uhl 1988, Uhl and Jordan 1984, Kapelle et al. 1995, Nepstad 1990, Zahawi and Augspurger 1999). Zahawi and Augspurger (1999) studied early succession in four abandoned unseeded fields of different age in Ecuador. They found that, in general, species richness increased over time and that secondary forest with 25-40 years since abandonment had the highest diversity while the open site with 5-8 years had the lowest diversity. Uhl and Jordan (1984) studied the dynamics of early succession in Amazonia after forest cutting and burning, and found 56 tree species taller than 2 m after five years. More than half of these were primary forest species. Kapelle et al. (1995) reported that early and late successional forests are more diverse than primary forests in a montane forest in Costa Rica. Moreover, they concluded that secondary forests at higher altitudes are as diverse as tropical lowland forests. However, the levels of genetic variation in abandoned pastures have not been studied as succession progresses.

Swietenia macrophylla (Mahogany) is one of the timber species considered threatened by the International Timber trade Organisation. Mahogany has been logged from Mexico and Central America since the 17th century (Snook 1996). In Costa Rica, it is considered an endangered tree species by most foresters as there are only a few locations where the species is currently found. This is particularly true in the dry areas of western Costa Rica where mahogany was harvested intensively.

We studied the levels of genetic variation in four abandoned pastures with different period of time elapsed since last disturbance, commonly fire. In addition, we compared the levels of variation found in these four sites with that found in a selectively logged mature forest.

The genetic studies were carried out...
using five microsatellite marker loci developed by White and Powell (1997). We collected 20 individual trees and saplings from five successional sites in the Santa Rosa National Park, Guanacaste, Costa Rica. The selection of the sites was based on data available in the park on the occurrence of fire during the last 20 years. We selected sites where disturbances occurred 6, 9, 15, 20 years ago. The sites were named Jenny I, Jenny II, Las Mesas and Príncipe, respectively. In addition, we also selected a mature forest site with relatively low human disturbance (Janzen 1983, Burnham 1997).

We found significant levels of genetic diversity in all sites. Overall, there were between 15 and 19 alleles in each of the successional sites (Figure 20). We also observed more than one allele in each locus examined and most alleles were present in more than one site (Figure 21). The relatively low level of genetic differentiation between sites (Fst = 0.08, S.D.0= 0.14) indicate that most of the variation is found within sites.

The results presented here indicate that, in spite of the high levels of disturbance, it is possible to restore S. macrophylla populations with significant levels of genetic diversity. Our results also indicate that the few adult trees left in the fields, along with numerous saplings and juveniles, are now an important sample of the genetic diversity once present in this area. Moreover, these trees are serving as a reservoir for the re-colonisation of abandoned pastures and thus they have an important role in restoring these dry forests in Costa Rica.

More information can be obtained from Maquil Céspedes and Dr. Oscar J. Rocha (ojrocha@cariari.ucr.ac.cr) at Escuela de Biología, Universidad de Costa Rica, Ciudad Universitaria “Rodrigo Facio”, San Pedro, San José, Costa Rica.

<table>
<thead>
<tr>
<th>SITE</th>
<th>Numbers of Alleles</th>
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<tr>
<td>Jenny I</td>
<td>15</td>
</tr>
<tr>
<td>Jenny II</td>
<td>19</td>
</tr>
<tr>
<td>Las Mesas</td>
<td>18</td>
</tr>
<tr>
<td>Príncipe</td>
<td>17</td>
</tr>
<tr>
<td>Mature Forest</td>
<td>15</td>
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> Figure 2: Variation in the number of alleles found in each of the successional sites. In section: Restoration of genetic diversity in Swietenia macrophylla in Costa Rica

LITERATURE CITED

Conservation, management and sustainable use of forest genetic resources in Brazil and Argentina

Tropical forests provide a wide range of products as well as socio-economic and ecological services that support human lives in many ways. However, forest resources of South America are declining at an alarming rate (FAO 2001). The underlying causes are complex and diverse, and so are the consequences. The BMZ funded project “Conservation, management and sustainable use of forest genetic resources with reference to Brazil and Argentina” aims at developing appropriate management practices to support conservation efforts through an improved understanding of human impact on the genetic diversity and ecological processes in four selected ecosystems. These are the Araucaria araucana forests in southwest Argentina, the Araucaria angustifolia ecosystems in southern Brazil and northern Argentina, the Atlantic forests in southeastern Brazil, and the Amazonian rainforests in northern Brazil.

The project collaborates with local communities in five locations. At each site, a local research institute conducts the research in collaboration with local NGO’s, governmental organisations and community representatives. These have been involved in the process from the very beginning to ensure that the project outputs meet local needs while managing natural resources properly. The project seeks to develop sustainable utilisation practices for timber and non-timber forest products (NTFP), contribute to the restoration of degraded landscapes and minimise land-use changes and integrate socio-economic, genetic and ecological research. While realities and problems are widely different, the same working hypotheses and methodologies are used to be able to compare the selected sites.

The project has been operating for two years now and some results from three sites, i.e. the Araucaria angustifolia in Brazil, the Araucaria araucana in Argentina and the Mata Atlântica in Brazil, are given in the following chapters. The project will continue one more year after which it will be time to extrapolate and make broader generalisations based on the results and test their applicability in other ecosystems and sites in the tropics.

Further information on the BMZ project in Brazil and Argentina can be obtained from Mr. Paulo van Breugel, Associate Scientist, IPGRI Regional Office for the Americas (p.breugel@cgiar.org).

**Literature Cited**

http://www.fao.org/docrep/003/y0900e/y0900e00.htm
Araucaria angustifolia genetic resources in Brazil

The mixed Ombrophilous forest with Araucaria angustifolia is one of the most important biome that occurs naturally in the southern and southeastern Brazil. It extends from 19°30’S to 31°30’S and 41°30’W to 54°30’W including a small area in the Province of Missiones, Argentina. The original Araucaria forests covered an estimated area of 200,000 km² (MAACK 1981). These forests were extensively harvested as the human population and agriculture area increased. The original area was reduced to less than 3%, with only 0.7% being considered as primary forests (FUPEF 2000).

This project covers activities of the Araucaria angustifolia Research Group, as proposed in the workshop held in Piracicaba, Brazil, in June 1999. At the moment A. angustifolia is the target species but it has been discussed that research focus should be widened. The inter-disciplinary research team includes researchers in ecology, genetics and socio-economics as well as participants from various local stakeholder groups. The researchers working at universities (Federal University of Paraná and State University of Londrina), the National Center for Forest Research of Embrapa (Brazilian Ministry of Agriculture), INTA – National Institute for Agricultural Technology of Argentina and two NGO’s (Bernardo Hakvoort Agroforest Institute - IAF and Rureco). The FUPEF / PROBIO (Project of Conservation and Sustainable Use of Brazilian Biodiversity) is a key partner because its researchers are developing a study on socio-economics and legislation related to Araucaria forests in the Parana State.

The Araucaria angustifolia project is carrying out studies on the genetic variability of this species in a natural population, a logged population and a gene bank-conserved germplasm collected from the wild population. This information will be used to define conservation strategies taking into account the socio-economic aspects of the farmers who own reminiscent areas of Araucaria forest. The socio-economic approach will be developed using secondary data and questionnaire answered by local people in countryside of Parana state. Recently, some A. angustifolia populations in the Province of Missiones, Argentina experienced problems with seed production and therefore joint research activities on reproductive biology are being developed together with Argentinean partners.

For more information about our research with Araucaria forest, please contact Juliana Vitória Messias Bittencourt (vitoria@floresta.ufpr.br).

Literature cited


Traditional faxinal system with Araucaria angustifolia (Paraná, Brazil)
simple nursery practices for native forest tree species were taught. Seed collection activities were also carried out with the help of some community members.

Livestock and wild animals are a threat to natural regeneration as they eat seeds during the seed fall in autumn and germinated seedlings during spring. The micro-histological analysis of faeces is the best method for diet estimation in a range scale. It is based on the microscopic identification of the non-digested remains and allows the analysis of an unlimited number of samples. Different proportions of *Araucaria* seed were found in faeces of different animals that were collected in late spring (germination phase) and summer (seed fall) from eight sites of *A. araucana* forests. Preliminary results indicate that the highest proportion of seed tissues were found in faeces of two introduced wild animals (red deer and boar) and of cows. To a lesser degree, seed tissue was found in faeces of sheep and goats whereas no identifiable cells were found in those of horses. Different livestock management practices for different domestic animals and a strong control of introduced wild animals seem to be necessary to assure the natural regeneration of *A. araucana* in those sites where germination and recruitment of seedlings is still possible.

Seeds were also collected from 25 populations within the whole natural distribution area of *Araucaria araucana* in Argentina for a seed study. Seed traits like weight and size were found to vary with geographical and ecological conditions. Germination capacity is one of the most important adaptive traits often analysed in genealogical studies. In the present study, seed weight was significantly correlated with germination capacity ($r=0.81$). Part of the collected seeds were processed in the nursery to obtain seedlings for provenance and progeny trials and for rehabilitating *A. araucana* populations.

An evaluation of the extraction rate of seeds by indigenous people during the last 15 years suggests that the forests in the study area have an interval of 3 years in the production of piñons. This could be related to the exhaustion of plant carbohydrate reserves. In addition, spring precipitation seem to have a strong influence as we found a negative correlation between spring rains (when pollination occurs) and productivity 16-18 months later, mainly in forests in more humid areas. The large scale climatic phenomenon of ENSO (El Niño-Southern Oscillation) could be the principal factor that determines the pattern of years of high and low seed production. First data analysis indicated that the current extraction rate of seeds by indigenous people should have no impact on the regeneration in years of high productivity, but could be a limiting factor in other years. A change in the current extraction regulations appears to be
necessary to take into account the variation in seed production based on a given year and ecological conditions of a stand.

Through co-dominant isozyme gene markers, genetic differentiation and diversity among and within populations are being studied. Electrophoretic analysis of haploid conifer endosperm tissue would allow, for example, the understanding of gene flow and breeding systems which are of great importance especially in the eastern fragmented populations. First of all, phenotypic variation was found in IDH, PGM, GOT, PGI, MNR, MDH and SKDH enzyme systems. The genetic control of the observed segregation is being tested in order to determine the needed gene markers. According to these preliminary results we expect to determine about 10 gene marker loci which are thought to detect enough genetic variation. Through these markers, genetic diversity (variation within) and differentiation (variation among populations) of Araucaria will be estimated at regional and local levels. The utilisation of other genetic markers like AFLP and microsatellite is also being considered.

Further information can be obtained from Dr. Leonardo Gallo (lgallo@bariloche.inta.gov.ar) at Unidad de Genética Forestal, Instituto Nacional de Tecnología Agropecuaria, Argentina.

Forest genetic resources of Mata Atlântica do Interior (Tropical Semi Deciduous Forest), Brazil

The Pontal do Paranapanema is one of the poorest regions in the state of São Paulo, situated in the confluence of the two rivers, Paraná and Paranapanema. It falls within the legal boundaries of the Mata Atlântica zone, meaning that use of the forest is regulated. The original vegetation of this region is classified as “Mata Atlântica do Interior or Planalto” (seasonal semi-deciduous forest). Forest fragmentation started relatively recently in this region as compared to most other parts of the country, excluding the northern states.

The present landscape in the Pontal do Paranapanema was shaped over the last 50 years, resulting in less than 1.85% of the land covered by the original forests. The remaining forests are distributed over many fragments with a total area of approximately 50,000 hectares. Together, they constitute most of the remaining forest genetic resources of the Mata Atlântica do Planalto in the São Paulo state. Many of these fragments can be found in areas that are in the process of agrarian reform. These are the areas were landless farmers, often from other regions, are settled.

In the framework of the agrarian reform, 60 settlements have been established with a total of about 6,000 families on 60,000 hectares. The prospect for the future is that totally 50,000 families will be settled on 1 million hectares of abandoned and promiscuous land. This may strongly increase the pressure on the remaining forest fragments causing further depletion of the ‘Mata Atlântica do Planalto’ forest genetic resources.

The project aims to produce and collate information on what will contribute to the development and implementation of sustainable management of Mata Atlântica forest fragments in Pontal do Paranapanema, combining conservation and use of forest genetic resources by rural settlements. Furthermore, the activities aim at integrating forest genetic resources conservation and regional land-use priorities as well as the development and improvement of the current agrarian reform model without causing erosion for biodiversity.

Two forest fragments of 300 and 2,000 hectares and the Morro do Diabo National Park with approximately 35,000 hectares were selected for research sites. The two fragments are located in the settlements of Madre Cristina and Tucano, respectively. The former has been existing for two and a half years and has now 210 families. The latter has been existing for 10 years and consists of 38 families. The Morro do Diabo National Park is the largest forest fragment of the Mata Atlântica Do Interior region and still contains areas with relatively undisturbed forest areas. The project analyses forest dynamics in the selected areas focusing on four tree species, i.e. Hymenaea courbaril, Peltophorum dubium, Cedrela fissilis and Copaifera langsdorffii. The species were selected by the local communities, scientists and other stakeholders based on their current and potential economic and ecological values. The aim is to assess the impact of fragmentation on the ecological and genetic processes of the four target species and to evaluate the current and potential role of the forests as a source of income for the local communities. A third element of the project is the development and implementation of agroforestry systems as an alternative land-use
system that will harmonise the use and conservation of forest genetic resources.

The preliminary results of inventories on the populations of the four target species in Morro do Diabo show a clear preferential distribution, indicating occurrence in a certain stratum with specific vegetation structure, topography and soils while avoiding other strata. It is possible that during the fragmentation process certain environments are diminished or even eliminated, causing drastic changes in the sustainability of populations of species whose distribution is limited to that specific stratum. The results of the surveys in the fragments indicate that, for all four species, population structures and densities are different from those in the park. Most divergent are the populations in Tucano that can partly be contributed to the high level of disturbances in recent years (fire, cutting, invasive exotic grass species). The populations in Madre Cristina, notwithstanding its much smaller size, have a spatial structure more similar to the populations in the Morro do Diabo National Park. This is probably due to lower levels of disturbances and the vicinity of the park.

The effect of the rural communities that live around the studied forest fragments is principally predatory, causing an unsustainable situation. One form of illegal utilisation of forests by these communities is selective logging of wood for local markets as well as to make tools, fences and house constructions and to obtain firewood. Collection of non-wood products, such as honey, medicinal plants and, more recently, ornamental plants is another important use of the forests. Together with these forms of exploitation, hunting of wild animals is one of the activities with the largest impacts on the fragments. In addition to the local communities living around the fragments, people from urban areas are also using the forest fragments for hunting, thus increasing problems. The intensity of use of forest resources is different in the two fragments, related to their size, age and the size of the human settlements.

One of the project goals is to raise awareness among the settlers and their leaders on the importance of forest genetic resources. In relation to this, the project has already adopted a new element, installation of experimental agroforestry plots. These plots will combine the use of agricultural crops and medicinal plants that are of interest for the settlers to the four target tree species of the project. Medicinal plants were included as a result of specific requests from the local communities. At the moment, the local communities have indicated three pilot areas and planting have been started.

**GENETIC STUDIES**

Detailed analyses of genetic structure, mating system and paternity (gene flow) of tree populations have also been carried out in the Atlantic Forests. Population dynamics can significantly affect evolutionary factors, such as selection and genetic drift, and thus may have important consequences on the genetic structure of tree populations. However, the magnitude of effects of drift and selection on patterns of genetic variation will depend on the reproductive ability of the organism and its impact on gene flow. The relationship between gene dispersal and levels of genetic diversity within populations can be illustrated by examining the effect of plant breeding system and pollen dispersal mechanisms on the levels of genetic diversity (Hamrick and Nason 1996).

One of the most direct methods to study gene flow is carrying out paternity tests between individuals from different populations with highly informative microsatellite markers (SSR). These have increasingly been used in studies on genetic structure, gene flow and paternity in tropical tree populations (e.g. Chase et al. 1996a,b; Dayanandan et al. 1999; Collevatti et al. 1999). They have yielded very precise data that allowed an improved understanding of the population dynamics of a number of species. However, essentially all studies on mating systems of Neotropical trees have been carried out for species in tropical forests of Central America, particularly in Panamá, Costa Rica and Mexico. Much work has also been done for Asian tree species but few studies have been published for Brazilian tree species to date.

The use of SSR’s have several advantages: I) it is codominant; II) it is abundant and uniformly dispersed on eukariotic genome; III) it
is highly multiallelic; IV) it is easily amplified by PCR assay; v) it can be analysed by multiplex assay, which permits analyses with lots of individuals and loci in relatively short period of time. However, RAPD markers are still dominant as they provide estimates of genetic diversity and outcrossing rates. The estimation of standard deviation can be reduced because high number of loci may be evaluated with RAPD markers, helping to obtain results with relatively good accuracy. In the present study, both RAPD and microsatellites were used for genetic studies with a major aim to understand genetic structure, gene flow and mating systems of the four target species. Knowledge on the biology of tropical forests and, in particular, the reproductive biology of tree species, can help designing conservation and scientifically sound utilisation strategies for these ecosystems.

For additional information on this study, please contact Prof. Paulo Kageyama (kageyama@carpa.ciagri.usp.br) at the University of São Paulo Piracicaba, Brazil.

**Socio-economic aspects related to FGR conservation in Quilombos remnants communities in the Brazilian Atlantic Forests**

During the last decades, research has begun to reflect increasing awareness of the fact that conservation and development are closely related subjects. In areas where people actually live directly from the exploitation and management of forest resources, the relationship between the environment and subsistence of human populations has become a fundamental factor for any conservation effort. Understanding traditional knowledge and practices is a first step towards more realistic and applicable policies and planning to conserve forest genetic resources.

The present project aims at tackling this issue, dealing with an endangered ecosystem (Atlantic Forests) and communities that are presently being asked to make choices about their future, i.e. the Remnants of Quilombos. It was primarily designed as a complement to a GTZ funded project in Brazil and Argentina (see the article in this issue of the FGR research highlights) since they both have similar socio-economic objectives.

The “Vale do Ribeira” (Ribeira Valley) in São Paulo and specifically the Quilombos slave remnant communities in the areas around the Intervales and Jacupiranga State Parks were considered to be important sources of socio-economic information. The Vale do Ribeira is situated in the South of São Paulo State and it comprises numerous conservation areas covered by Atlantic Forest. In the Vale do Ribeira, six conservation units (State Parks, Ecological Stations, etc.) encompass 200,000 hectares of forest. Another 400,000 hectares are protected under the label of “restricted use areas” or “environmental protection areas” (APA). Many communities live nearby the conservation units and a number of them have a part of their territories inside the parks, most of them inside the APAs.

Many of these communities are descendants of slaves that fled from the nearby farms in the 19th century. They subsequently formed “villages” called “quilombos” and the inhabitants’ remnants are called “quilombolas”. In the last ten years, some of those communities have been recognised as descendants of slaves. This had important consequences as the Brazilian 1988 National Constitution has guaranteed rights of formal land ownership to the “Quilombos Remnant Communities” (Comunidades Remanescentes de Quilombos). Later, governmental agencies carried out anthropological studies in order to confirm their origins. Hitherto, about 700 communities all over the country were initially pointed out as ‘slaves remnants’. Only 23 of them had already their territory formally recognised. São Pedro and Sapatu, the two communities that are part of this study, are found in the surroundings of Jacupiranga and Intervales State Parks. São Pedro has already obtained the land title while Sapatu is still engaged in the process of legitimisation.

The formal recognition by the Constitution had called attention to these communities and was followed by numerous governmental and non-governmental projects aimed to “promote their development”. Meanwhile, since the beginning of the 80’s, the agencies in charge of the Sao Paulo State Parks begun to realise that in order to succeed in their conservation efforts, they need to take into account the existence and needs of communities located in or around the conservation areas.

**LITERATURE CITED**


Conversely, the enforcement of environmental regulations in those ‘environmental protection areas’ do not allow the local inhabitants to use the land in their “traditional” way and prohibit the exploitation of “palm of heart” (palmito – *Euterpe edulis*) which is an endangered species. The palmito has been their major source of income since the 1950’s and the communities have become economically dependent on a single product while gradually loosing their previous sustainable principles. Community members say that they used to follow certain rules, as for example keeping a certain number of “mother trees” (mature enough to produce seeds) per area exploited. The abandonment of those practices came, paradoxically, together with the enforcement of the environmental regulations since the prohibition of using land for agricultural purposes triggered an intensification of the illegal exploitation of the species.

Conservation is effective only if the local communities can also participate in planning and implementing conservation efforts. To understand, assess and study the way they have been managing forest genetic resources and the impacts of external agencies’ intervention in the way they relate to the surrounding environment is fundamental to the design of practical, feasible and sustainable conservation and development policies.

Two species were chosen for the present study: *Euterpe edulis* and *Maytenus aquifolia*, a medicinal plant locally called “espinheira santa” which is used to treat stomach related diseases. This Project aims at assessing the role of local communities in the conservation/depletion of *Euterpe edulis* and *Maytenus aquifolia* genetic resources. The study has the following specific objectives:

- Identify the practices of resource use and management used by communities in the past and in the present;
- Understand changes occurred in these practices within a socio-economic and political perspective;
- Assess the role of public policies in the conservation and use of the two key species in the area;
- Finally, to contribute with propositions to public policy making in order to meet social, economic and environmental needs of the local communities.

The study will take one year (July 2001-July 2002) and is presently in the phase of mapping out important actors and gathering secondary ecological and genetic information.

For further information please contact Mariana Wongtschowski (marianarussa@tg.com.br) or Dr. Dalcio Caron (dalcaron@esalq.usp.br).
Ex situ conservation of FGR

Tropical Forest Tree Seed: Challenges to conservation and use

The IPGRI-DFSC project on recalcitrant and intermediate tropical forest tree seeds has covered a considerable ground in screening seeds of over 50 tropical forest species for their desiccation tolerance and storage behaviour. The participating National Forest Research Institutions have been busy in carrying out desiccation trials to establish minimum safe moisture content, best combinations of moisture content and temperature for storing. In addition, several other institutions in UK (Royal Botanic garden Kew), Denmark (Royal Veterinary Agricultural University, Danida Forest Seed Centre), South Africa (University of Natal), Kenya (ICRAF) and USA (US Forest Service) have provided invaluable support to the project in replicating the work of the National Research Institutions.

Most of the species were chosen because they are economically important in their country of origin and are expected to be recalcitrant. So far about 80% of the species targeted have been screened (see Table 1 for a summary of the results). Many of the investigations have clearly established the desiccation tolerance of the seeds, i.e. whether they are tolerant or sensitive. However, it is still difficult to generalise the seed storage behaviour of individual species. Preliminary results indicate that 40% of the species screened tend to show orthodox seed behaviour in their desiccation tolerance (see figure). For example, Adenanthera colubrina from Bolivia can be dried to 6.9% moisture content and still retain 98% germination. Other desiccation tolerant species include Diospyros caffra and Strychnos cocculoides from Kenya, Diospyros melanoxylon from India and D. mollis from Thailand, Bridelia micrantha from South Africa. The project is also showing that many of the species are desiccation sensitive like Cinnamomum cassia from Vietnam, Madhuca indica from India, Hancornia speciosa from Brasil and the Shorea species from Southeast Asia. About 10% of the species are intermediate, meaning that they are desiccation intolerant to some extent. The neem (Azadirachta indica) is an interesting case. Its storage behaviour is a controversial one probably because of the use of its seeds at different development stages. It has been shown to be desiccation tolerant down to 4% moisture content and has intermediate storage behaviour. Other examples in this category include Buchanania lanzan (Indonesia) and Genipa americana (Brazil). Some species are showing inconclusive results and the experiments need to be repeated.

During this phase, we have witnessed a strong sense of collaboration between all partners, particularly between collecting and replicating partners who are exchanging their results, writing joint reports and exchanging seeds freely for the purposes of project. The project newsletter has also helped a great deal in harnessing this collaboration. The project is continuing to produce the newsletter twice a year. These newsletters provide the network with up-to-date information on project activities, key technical articles on recalcitrant seeds, preliminary results as they are being generated within the project and an updated address list. In addition to the newsletter, information on the project can be obtained on the DFSC Homepage (www.dfsc.dk) with links established to the IPGRI homepage (www.ipgri.cgiar.org). The web site contains information about the project work plan, protocol, preliminary results and also the more recent newsletters can be downloaded.

In order to build upon the capacity of research institutions for applied forest tree seed research, three regional training workshops for Africa, Latin America and Asian countries were successfully held during the past two years. The aim of the workshops was to bring people working together in the region to meet, discuss and share their experiences. The workshops were very practical, involving exercises in seed anatomy and desiccation trials.
Table 1. Summary results on desiccation trails

<table>
<thead>
<tr>
<th>Species</th>
<th>Preliminary result</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acmena acuminatissma</em></td>
<td>Seeds are sensitive to desiccation, with critical moisture content (mc) between 58.2 and 47.8%.</td>
<td>Wang, South China Agricultural University, May 2001</td>
</tr>
<tr>
<td><em>Acridocarpus natalitius</em></td>
<td>Seeds survive rapid desiccation to 6.08% mc. Germination decline to 20% when dried to 2.37% mc.</td>
<td>Drew, Erdey &amp; Berjak, University of Natal, February 2000.</td>
</tr>
<tr>
<td><em>Anadenathera colubrine</em></td>
<td>Seeds are desiccation tolerant when dried to 6.9% with high germination % (98%).</td>
<td>Espinosa, BASFOR, Bolivia, September 2000</td>
</tr>
<tr>
<td><em>Azadirachta indica</em></td>
<td>Intermediate, variation according to source of collection.</td>
<td>Naithani Varghese, Naithani &amp; Godheja, Pt Sravishankar Shukla University, Raipur, India, April 2001</td>
</tr>
<tr>
<td><em>Astronium graveolens</em></td>
<td>Seeds are desiccation tolerant and also cold tolerant.</td>
<td>Vasquez, CATIE, Costa Rica, January 2000</td>
</tr>
<tr>
<td><em>Bridelia micrantha</em></td>
<td>Seeds dried to 45.21% of axis mc had not effect on seed viability.</td>
<td>Shange, Erdey &amp; Berjak, Univeristy of Natal. January 2001</td>
</tr>
<tr>
<td><em>Buchanania lanzan</em></td>
<td>Seeds are desiccation and low temperature [15, 0 and –20° C] tolerant for limited period.</td>
<td>Naithani Varghese, Naithani &amp; Godheja, Pt Sravishankar Shukla University, Raipur, India, April 2001</td>
</tr>
<tr>
<td><em>Calophyllum brasiiliensis</em></td>
<td>Seeds are desiccation sensitive.</td>
<td>Vasquez, CATIE, Costa Rica, January 2000</td>
</tr>
<tr>
<td><em>Cavacoa aurea</em></td>
<td>Results were inconclusive but some seeds survived to an axis mc of 8.34%.</td>
<td>Drew, Erdey &amp; Berjak, University of Natal, February 2000.</td>
</tr>
<tr>
<td><em>Cinnamomum cassia</em></td>
<td>Seeds are very sensitive to desiccation. It is recommended to keep seeds at above 40% mc at 5° C.</td>
<td>Le Dinh Kha, Huy Son, Ho Quang, Tuan Hung, Research centre for Forest trees Improvement, Forest Science Institute of Vietnam, April 2001</td>
</tr>
</tbody>
</table>
### Table 1. Summary results on desiccation trails

<table>
<thead>
<tr>
<th>Species</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Cordyla pinnata</strong></td>
<td>Possibly desiccation sensitive.</td>
</tr>
<tr>
<td><strong>Diospyros melanoxylon</strong></td>
<td>Seed are desiccation tolerant up to 4.2% mc.</td>
</tr>
<tr>
<td><strong>Diospyros mollis</strong></td>
<td>Seeds are desiccation tolerant down to 8% mc.</td>
</tr>
<tr>
<td><strong>Dovyalis caffra</strong></td>
<td>Seeds are desiccation tolerant down to low mc of 4%.</td>
</tr>
<tr>
<td><strong>Genipa americana</strong></td>
<td>Tolerate desiccation down to 9.34 % mc. Can be stored at low temperature in the short term (10 months).</td>
</tr>
<tr>
<td><strong>Hancornia speciosa</strong></td>
<td>Seeds are desiccation sensitive and do not tolerate any storage temperature or packing. Confirmed by experiments in CATIE, Costa Rica.</td>
</tr>
<tr>
<td><strong>Harpephyllum caffrum</strong></td>
<td>Desiccation experiment inconclusive due low germination of control. Seeds dried to 7.10 % had similar germination levels as controls (10%).</td>
</tr>
<tr>
<td><strong>Illicium verum</strong></td>
<td>Seeds are desiccation sensitive.</td>
</tr>
<tr>
<td><strong>Kigelia africana</strong></td>
<td>Seeds are desiccation tolerant.</td>
</tr>
<tr>
<td><strong>Lophira lanceolata</strong></td>
<td>Experiment on going.</td>
</tr>
<tr>
<td><strong>Madhuca indica</strong></td>
<td>Seeds are desiccation sensitive and cold sensitive.</td>
</tr>
<tr>
<td><strong>Manilkara kauki</strong></td>
<td>Seeds desiccation tolerant down to 10% mc.</td>
</tr>
<tr>
<td><strong>Neobalanocarpus heimii</strong></td>
<td>Seeds are desiccation sensitive.</td>
</tr>
</tbody>
</table>

**Source**
- Diallo, Institute Senegalais De Recherche Agronomique, Senegal, May 2001
- Naithani Varghese, Naithani & Godheja, Pt Sravishankar Shukla
- Lait, ASEAN Forest Seed Centre, Thailand, April 2001
- Omondi, Kenya Forest Research Institute, February 2000
- Salamao, CENARGEN, Brasil, September 2000
- Salamao, CENARGEN, Brasil, September 2000
- Shange, Erdey & Berjak, Univeristy of Natal. June 2000
- Le Dinh Kha, Huy Son, Ho Quang, Tuan Hung, Research centre for Forest tres Improvement, Forest Science Institute of Vitenam, April 2001
- Yameogo/Gamene & Neya, Centre national de Semencess Forestieres, Burkina Faso
- Naithani Varghese, Naithani & Godheja, Pt Sravishankar Shukla University, Raipur, India, April 2001
- Soetisna & Rantau, R&D Center for Biodiversity, Indonesia, July 2000
- Nadarajan & Krishnapillay, Forest research Institute of Malaysia, December 1999
**Table 1. Summary results on desiccation trails**

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</thead>
<tbody>
<tr>
<td><em>Podocarpus nagi</em></td>
<td>Seeds of <em>Podocarpus nagi</em> are desiccation tolerant.</td>
<td>Wang, South China Agricultural University, May 2001</td>
</tr>
<tr>
<td><em>Pouteria macrophylla</em></td>
<td>Seeds are desiccation sensitive when dried below 35% mc.</td>
<td>Espinosa, BASFOR, Bolivia, September 2000</td>
</tr>
<tr>
<td><em>Psychotria capensis</em></td>
<td>Seed are desiccation tolerant down to 13.51% mc.</td>
<td>Shange, Erdey &amp; Berjak, Univeristy of Natal, June 2000</td>
</tr>
<tr>
<td><em>Shorea assamica</em></td>
<td>Seeds are desiccation sensitive below 20% mc.</td>
<td>Nadarajan &amp; Krishnapillay, Forest research institute of Malaysia, December 1999</td>
</tr>
<tr>
<td><em>Shorea leprosula</em></td>
<td>Desiccation sensitive when dried below 20% mc.</td>
<td>Soetisna &amp; Rantau, R&amp;D Center for Biodiversity, Indonesia, April 2001</td>
</tr>
<tr>
<td><em>Shorea roxburghii</em></td>
<td>The seeds tolerate partial desiccation, but below 27% mc the viability is reduced. Similar results obtained by FRIM, Malaysia.</td>
<td>Lait &amp; Chaisurisri, AFTSC, April 2000</td>
</tr>
<tr>
<td><em>Shorea siamensis</em></td>
<td>Seeds are desiccation sensitive when dried below 30%mc.</td>
<td>Lait, ASEAN Forest Seed Centre, Thailand, April 2001</td>
</tr>
<tr>
<td><em>Sterculia quinqueloba</em></td>
<td>Seed are desiccation tolerant when dried to 10 % moisture content.</td>
<td>Muntali &amp; Gondwe, Forest Research Institute Malawi, Msanga, National Tree Seed Programme, Tanzania; Fletcher &amp; Pritchard, RBG Kew, UK</td>
</tr>
<tr>
<td><em>Strychnos cocculoides</em></td>
<td>Seeds are desiccation tolerant, best result 15-16°C after 3-6 months.</td>
<td>Msanga, National Tree Seed Programme, Tanzania; Fletcher &amp; Pritchard, RBG Kew, UK</td>
</tr>
<tr>
<td><em>Syzygium cuminii</em></td>
<td>Seeds recalcitrant, highly desiccation sensitive (Tanzania, S. Africa).</td>
<td>Msanga, National Tree Seed Programme, Tanzania;</td>
</tr>
<tr>
<td><em>Vitellaria paradoxa</em></td>
<td>Seeds are desiccation sensitive.</td>
<td>Yameogo/Gamene &amp; Neya, Centre national de Semences Forestieres, Burkina Faso</td>
</tr>
<tr>
<td><em>Warburgia salutaris</em></td>
<td>Tolerant to desiccation to 7% mc.</td>
<td>Msanga, National Tree Seed Programme, Tanzania; Fletcher &amp; Pritchard, RBG Kew, UK</td>
</tr>
<tr>
<td><em>Warbugia ugandensis</em></td>
<td>Seeds are desiccation tolerant, but are cold sensitive.</td>
<td>Omondi, Kenya Forest Research Institute, January 2000</td>
</tr>
<tr>
<td><em>Ximenia americana</em></td>
<td>Desiccation tolerant when dried down to 3% mc.</td>
<td>Msanga, National Tree Seed Programme, Tanzania;</td>
</tr>
<tr>
<td><em>Zanthoxylon zanthoxyloides</em></td>
<td>Experiment inconclusive.</td>
<td>Yameogo/Gamene &amp; Neya, Centre national de Semences Forestieres, Burkina Faso</td>
</tr>
</tbody>
</table>
Genomic approaches to forest breeding and conservation

Molecular marker-based breeding strategies have been used to accelerate the process of moving trait genes into high-yielding germplasm. More recently, genomics-based strategies for gene discovery or finding new alleles, coupled with high-throughput transformation processes and miniaturised, automated analytical and functionality assays have accelerated the identification of product candidates. Genome-related databases have already become an invaluable part of the scientific landscape, commonly visited by molecular biologists and bioinformatics people. The role of these databases will be greater only if these data could be combined with other relevant biological information, such as from complex adaptive traits. It is clear that there is need for both highly detailed and simplified database platforms, the latter being specially needed to make expert domain data more accessible to non-specialists. The main goal of this project is to establish a user-friendly Internet database designed to offer up-to-date information for the development of potential genetic markers useful for forest conservation and/or forest breeding based on gene sequences of known function.

We believe that with this project, knowledge gained from model systems, such as from Arabidopsis thaliana, from well-studied forest species and from a few major crops could be made available and applied across a broader range of species. The extrapolation of information from the well-studied species to others, including many tropical tree species, could provide a solid base for designing strategies for their improvement and conservation. The project created a virtual institute for the divulgation of information and research on forest genomics (NPGEF), which could be found at http://www.ipef.br/melhoramento/genoma/. This site also contains a virtual library and links to other sites related to forestry and genomics.

For additional information, please contact Luciana D. Ciero (lctleme@terra.com.br) or Marcelo C. Dornelas (mcdorne@carpa.ciaeir.uap.br) at IPEF-LCF/ESALQ-USP, Departamento de Ciências Florestais, Brazil.

Regional programmes and collaboration on FGR

EUFORGEN: The role of FGR Networks in supporting European research

With their regular annual meetings and with the frequent contacts among scientists from different European countries, the five species-oriented EUFORGEN Networks (http://www.ipgri.cgiar.org/networks/euforgen/euf_home.htm) provide a unique opportunity for the identification of research needs and for planning and developing joint project proposals. As a result, Network members often work together with, or as partners involved in different research projects, discuss the applications and facilitate broad dissemination of results. EUFORGEN Networks are composed of members officially nominated by the participating countries, who act as national focal points for the species concerned. They involve more than thirty European countries, and therefore represent a significantly wider eco-geographic coverage than most research projects. At the technical level, EUFORGEN Networks endeavour to develop collaborative activities that complement the approach adopted in individual research projects, for example linking in situ and ex situ conservation. In fact, during the last few years there has been an intense research activity on forest genetic diversity in Europe, with particular attention to broadleaved tree species. The European Commission has financially supported most projects in this area.

Two most successful examples include EUROPOP – the recently completed project on Genetic Diversity in River Populations of European Black Poplar, coordinated by Alterra Green World Research, the Netherlands, and the Concerted Action for the Evaluation of Genetic Resources of Cork Oak, which was led by Estação Florestal Nacional, Portugal. EUROPOP, originally initiated by members of the EUFORGEN black poplar (Populus nigra) Network, developed a set of techni-
cal recommendations that will be on the agenda of the forthcoming Network meeting in October 2001. Discussion on these and their later adoption will contribute to accomplishing the main objective of the Network – to facilitate the implementation of practical gene conservation measures in Europe’s riparian ecosystems. The synergies between the cork oak (Quercus suber) project and the corresponding EUFORGEN Network were recognised as essential for establishing a provenance experiment in seven Mediterranean countries (Algeria, France, Italy, Morocco, Portugal, Spain and Tunisia) three years ago. The Network has continued to play a role in exchanging information among these countries after the completion of the project.

Conservation of Elm Genetic Resources is conducted in the framework of EC Regulation 1467/94 (Gen Res 78). The project aims at a better evaluation of the existing collections of European elms (Ulmus glabra, U. minor, U. laevis) and effective ex situ conservation measures. It involves partners in nine countries that provide expertise on different aspects such as molecular markers, cryopreservation, entomology and pathology. The activities include the establishment of an European database, characterisation of genetic diversity using molecular markers, identification of valuable clones, rationalisation of existing collections, development of cryopreservation techniques, establishment of a core collection and raising public awareness. In particular, the project contributed to the formulation of the ex situ conservation strategy for threatened Ulmus species in Europe. This was complemented by an in situ conservation strategy adopted by the EUFORGEN Noble Hardwoods Network (which considers elm species to be highest conservation priority), emphasising the need for dynamic and integrated management of genetic resources in Europe.

The coordinator of the project from CEMAGREF, France, attended all five Network meetings held so far, ensuring a continuous flow of information. Links between activities in the EU-member and non-member countries have also been established.

Research on the geographic variation of forest trees, supported by the EU-funded CYTOFOR project, is essential for gene conservation purposes and for tree improvement. The project has had a number of components, including phylogeographic studies, historical (post-glacial migration routes) investigations, hybridisation between species, links between ecological and population genetic studies. It took a multiple species approach, combining genetic data on 22 economically or ecologically important species of seven different families. Nine countries were involved. Obvious applications of the research results include certification of forest reproductive material, determination of origin of populations and priority setting for conservation measures. The tools included chloroplast DNA markers for phylogeographic studies. Distribution patterns of haplotypes appear to be strongly related to the biology of the species or to the history of the populations. Sorbus terminalis showed no geographic structure whereas the patterns for Ulmus were comparable to those for Quercus, showing a clear geographic pattern in Europe (http://www.pierroton.inra.fr/cytofor). The results of CYTOFOR provide essential input to the technical recommendations that are currently being developed by the Noble Hardwoods Network. They target to reach forest managers and agencies responsible for gene conservation in European countries.

The new CASCADE project (http://soi.cnr.it/~chestnut/home.html) focuses on evaluation of genetic diversity at adaptive traits and genetic markers in chestnut (Castanea sativa) in relation to evolutionary factors and human impact, and on the formulation of long-term conservation priorities. Twelve institutions from Greece, France, Italy, Spain, Sweden and UK participate in this project. The project covers different research issues and socio-economic aspects of gene conservation. A long-term gene conservation strategy for chestnut was developed within the framework of the Noble Hardwoods Network. The participating countries in EUFORGEN are the designated users of the results of the project, which will provide guidance for the further development and implementation of the strategy.

The objective of DYNABEECH (http://www.biotheon.com/dynabeech) is to assess the impact of forest management on ecological and genetic structures in European beech (Fagus sylvatica) by comparing intensively managed forest and “virgin forests” in four locations. Six partners from Austria, France, Italy, Germany and the Netherlands contribute to the project. OAKFLOW (http://www.pierroton.inra.fr/oakflow) has the aim of examining intraspecific and interspecific gene flow as a mechanism for promoting diversity in temperate white oaks (Quercus spp.). There are 13 partners and a number of subcontractors, which also host intensively studied plots.
The objectives are to trace geneflow by pollen and seed, to evaluate ecological and genetic consequences of geneflow, and to evaluate impacts of geneflow on management rules. The management rules developed and particularly the data on neighbour- hood size that have been obtained are very relevant for the development of conservation guidelines prepared and disseminated through the EUFORGEN Social Broadleaves (temperate oaks and beech) Network. In fact, this was one of the main items discussed during the fourth meeting of the Network in Norway in June 2001.

The projects listed so far are funded by the European Union. However, through EUFORGEN it was also possible to initiate a project on Genetic Resources of Broadleaved Forest Trees Species in Southeastern Europe, supported by the government of Luxembourg. It aims at further developing national strategies on the conservation and sustainable use of forest genetic resources in Bulgaria, Moldova, Romania and Ukraine. A complementary approach was chosen encompassing the in situ conservation of genetic diversity of native forests, further development and use of technologies for ex situ conservation. The project put strong emphasis on capacity building and the strengthening of links between the institutions and scientists involved with their counterparts in other European countries. The main objective of the current, second phase of the project (2001-2004) is to create the conditions for the conservation and sustainable management of forest genetic resources in the participating countries. This will be achieved through complementary conservation and management of broadleaved forest genetic resources; addressing policy issues and developing proposals to help address the situation and support the development of the national programmes; information management and public awareness. The project has strong links with four Networks of the EUFORGEN Programme and provides an opportunity for testing some of the tools that have been developed.

Finally, EUFORGEN meetings also offer the opportunity to highlight other projects in which the Network members are not directly involved. For example, during the last Noble Hardwoods Network meeting (held in Ireland in May 2001), there was a presentation of a new project called ‘Improving Fraxinus productivity for European needs’. It will include testing, selection and propagation of improved genetic material to address genetic diversity, breeding, sexual and vegetative reproduction and other important aspects of productivity (http://www.eu.int/comm/research/quality-of-life/ka5/en/00631.html).

These examples illustrate the role of the EUFORGEN Programme in mobilising funds for tasks carried out by the Networks, which aim at promoting and facilitating genetic conservation activities in Europe. There is a further need to collect and integrate information from different sources (i.e. molecular markers, provenance experiments, historical sources and ecological data) for the formulation of effective genetic conservation strategies in the long term. This knowledge can only be generated and effectively used through the collaboration among all the relevant international and national research efforts.

Dissemination of research results is, of course, another important aspect. There are several projects currently active in research on forest genetic diversity and many results are available. An increasing number of countries are eligible to participate in the EU framework programmes and projects as a result of the European integration process. In order to reach a wider audience of forest managers and other users in all European countries, plans are underway to hold a conference to share the results obtained by the different groups with participants from the mentioned EU-funded projects, EUFORGEN Networks and other stakeholders in 2002.

More information on EUFORGEN is available from: Dr. Jozef Turok, EUFORGEN Interim Coordinator (j.turok@cgiar.org).
After the establishment of the Sub-Saharan African Forest Genetic Resources (SAFORGEN) Programme in 1999, the first activity of the programme was to establish links with Sub-Saharan African (SSA) countries and elaborate basic documents, such as programme objectives, mode of operation, a list of priority activities and the programme strategy. SAFORGEN basic documents were sent to SSA countries for endorsement in 2000 and the programme has also finalised the draft of its strategy. At the same time the Secretariat of SAFORGEN has continued networking activities and implemented activities to develop conservation strategies for important tree species in the region.

By May 2001, the following countries endorsed IPGRI’s letter of agreement, appointed national coordinators and selected SAFORGEN networks in which they would like to participate: Benin, Burkina Faso, Chad, Congo ( Brazzaville), Ethiopia, Gambia, Guinea, Kenya, Madagascar, Mali, Niger, Senegal, Sudan, Togo and Uganda.

Three key elements are highlighted in SAFORGEN strategy: (1) strong partnership, (2) strengthening FGR programmes in SSA countries, and (3) developing methodologies and tools for conservation and sustainable use of FGR. To implement this strategy, a holistic view on gene conservation will be adopted including a multidisciplinary approach linking various disciplines. Regional collaboration will be enhanced by networking to optimise the use of available resources in member countries and to gain comparative advantages.

SAFORGEN TREE SPECIES NETWORKS

Readers of this newsletter were informed last year that the Programme had organised the first Medicinal Tree Species Network meeting in Cotonou, Benin on 15-17 December 1999. The network came up with a list of priority species. A Togolese NGO, CERPHAPLATA is carrying out activities on two medicinal tree species Alstonia boonei and Nauclea latifolia well-known by local people for their anti-malarial properties. The genetic diversity and the impact of harvesting on the two species are being studied.

In 2000, SAFORGEN organised its first Food Tree Species Network meeting in Ouagadougou, Burkina Faso and 20 participants from 12 SSA countries attended the meeting. Medicinal and food tree species are more important for local people and thus it was crucial for SAFORGEN to first launch the activities of these two networks. The two major problems that sub-Saharan African countries are facing are related to malnutrition and health care. The farmers need diversity as security against unpredictable climatic conditions, to optimise use of their resource base and also to diversify their agricultural production especially in areas with poor infrastructure or under devel-
oped markets. Forest fruits have long been used to complement diets. Fruits contain vital nutrients and essential vitamins, which are important especially for children who are often prone to malnutrition and related diseases.

During the first Food Tree Species Network meeting, participants agreed to a list of priority species (in priority order): Tamarindus indica, Parkia biglobosa, Adansonia digitata, Vitellaria paradoxa, Ziziphus mauritiana, Anacardium occidentale, Irvingia gabonensis, Balanites aegyptiaca, Detarium microcarpum, Hyphaene thebaica and Sclerocarya birrea. Also, the network chairs listed priority activities that will be shared among member countries:

- Developing leaflets and posters for the target species: Tamarindus indica (Kenya); Parkia biglobosa (Burkina Faso); Adansonia digitata (Guinea); Vitellaria paradoxa (Burkina Faso), Ziziphus mauritiana (Niger), Anacardium occidentale (Togo), Irvingia gabonensis (Benin), Balanites aegyptiaca (Chad), Detarium microcarpum (Burkina Faso), Hyphaene thebaica (Sudan) and Sclerocarya birrea (Niger).
- Documenting the species.
- Drafting proposals: ten concept notes were drafted, seven out of which were based on tree species in humid ecosystems.

**DEVELOPING CONSERVATION STRATEGIES for six SAFORGEN priority species**

In August 2000 UNEP awarded a research grant to SAFORGEN to develop conservation strategies for selected tree species. Three SAFORGEN member countries (Benin, Kenya and Togo) were selected to carry out the studies based on their ecological conditions. Subsequently, six model tree species were selected according to their geographic distribution, mode of regeneration and utilisation. The Kenya Forestry Research Institute (KEFRI) is focusing on two food tree species (Dialium orientale and Tamarindus indica) while the National University of Benin is studying two fodder tree species (Khaya senegalensis and Afzelia africana). CERPHALPLATA is conducting research on two, anti-malarial tree species (Alstonia boonei and Nauclea latifolia).

The three institutions are conducting the following studies on the selected species:

- Ecogeographic surveys
- Level of threats
- Ecological information such as the mode of distribution and seed dispersion, phenological observations, pollinators, etc.
- Natural regeneration
- Genetic diversity within the species

The final report of the project will come up with the conservation options for the six species according to the information gathered from these studies.

**PUBLISHING COUNTRY REPORTS on FGR**

FAO in collaboration with SAFORGEN Programme organized in September 1998 in Ouagadougou, a sub-regional workshop on conservation and sustainable utilization of FGR in Sahelian and North Sudanian zones. The main objectives of the workshop were to develop a synthesis report on the status of FGR in the sub-region and to come up with a sub-regional Action Plan. FAO and SAFORGEN Programme edited and published in 2001 the book with the synthesis report and the sub-regional Plan of Action. The two institutions with the financial support of Danida Forest Seed Centre, have also edited and published country reports that were prepared beforehand by national experts as well. They have been distributed within and outside the respective countries. Information regarding standard methodologies and protocols used for the reports can be found on the FAO website: http://www.fao.org/forestry/FOR/FORM/FOGENRES/homepage/Wpapers.stm.

For additional information on SAFORGEN, contact Dr. Oscar Eyog-Matig, SAFORGEN Coordinator, IPGRI Sub-regional Office for West and Central Africa (o.eyog-matig@cgiar.org).
A sub-regional workshop on FGR in Southeast Asia was held in Thailand between 26 February and 10 March 2001. The workshop was organised by Forest Genetic Resources Conservation and Management Project (FORGEN-MAP), which is a joint activity of the Royal Forest Department of Thailand (RFD) and the Danish Cooperation for Environment and Development (DANCED). The FAO Forestry Research Support Programme for Asia and the Pacific (FORSPA) and IPGRI provided additional support for this workshop. Totally 30 delegates from Cambodia, Indonesia, Laos, Malaysia, Philippines, Thailand and Vietnam participated in the workshop. FORSPA, IPGRI, Danida Forest Seed Centre (DFSC), and CSIRO Forestry and Forest Products from Australia were also represented.

The workshop was organised in different parts of Thailand, i.e. in the north (Tak, Kamphaeng Phet), north-eastern (Ubon Ratchatani) and south (Narathiwat), and field trips to relevant sites were included in the programme. Presentations during the workshop consisted of country reports and a number of invited papers. At the end of the workshop delegates conducted group work on criteria for priority setting, species links/common species priorities, utilisation/domestication and partnership in conservation of FGR and regulation/management of FGR.

The country reports revealed that the state of FGR conservation and the capacity of national institutions to implement related activities are quite different among the countries. The workshop was able to identify 65 priority species, which were listed in two or more country reports as important for conservation and use. However, the priority lists in the country reports were prepared using different approaches in the countries. Information to compile the priority lists were based on national workshops or similar arrangements with a range of different stakeholders in Cambodia (a workshop held in 2000), Thailand (1998), Indonesia (1978, 1995, 2000), Laos (1999) and Vietnam (2000). No national workshops on FGR have been organised in the Philippines, Malaysia or Myanmar.

The workshop also identified several issues that create obstacles for conservation and management of FGR in the sub-region. These were listed as follows: 1) lack of law enforcement, 2) lack of participation by local people, 3) limited resources of national institutions to carry out the work on FGR, 4) more emphasis is given to wildlife than plant conservation, 5) conservation efforts are more focused on ecosystems than species or genes, and 6) insufficient scientific data, information dissemination and networking.

The final discussions stressed the need to continue the efforts on FGR conservation and use in Southeast Asia. A follow-up meeting or workshop should be organised to initiate the formulation of a sub-regional action plan for conservation and use of FGR. All participating countries...
agreed that there is a need to establish a sub-region network on FGR to alleviate some of these obstacles and the workshop suggested that IPGRI should take a lead role in coordinating such an effort. More details on this workshop, including the country reports and the invited papers, can be found from the proceedings published jointly by FORGENMAP, IPGRI, FORSPA, DFSC and RFD.

Joint IPGRI-APAFRI efforts to increase FGR networking in the Asia Pacific region

As a follow-up to the recommendations of the Southeast Asian FGR workshop in Thailand, IPGRI and the Asia Pacific Association of Forestry Research Institutions (APAFRI) have initiated the development of a new FGR network, i.e. the Asia Pacific Forest Genetic Resources Programme (APFORGEN). The workshop recommendations were originally focused on Southeast Asia alone but IPGRI and APAFRI decided to expand the geographical coverage of the new network based on similar needs in other Asian countries. In a regional seminar in 1999, for example, APAFRI members had expressed their need for increased information exchange in biodiversity assessment and conservation methodology. In February 2002, IPGRI and APAFRI consulted their partners in 14 countries (tentatively Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, Vietnam and China) and requested their feedback for further development of the proposed programme and fundraising for its implementation.

The overall objective of APFORGEN is to manage tropical forest genetic diversity more equitably, productively and sustainably in the participating countries. The specific objectives of the proposed programme are to: 1) strengthen national programmes on forest genetic diversity; 2) enhance regional networking and collaboration; 3) locate and conserve genetic diversity of selected priority forest species; and 4) increase sustainable use of genetic diversity in natural and man-made forests. Target beneficiaries include forest research institutions, policy-makers, local communities and NGOs, government forestry departments and private forestry companies. Several international and regional organisations have also been requested to provide their feedback and ideas regarding APFORGEN and its activities. Once established, APFORGEN will be linked to the ongoing networking efforts on FGR in the South Pacific, i.e. the SPRIG programme so that the APFORGEN countries can learn from the experiences of the Pacific countries and also to increase information exchange with them. Similarly, APFORGEN will be linked to EUFORGEN and SAFORGEN.

For further details on APFORGEN and its development, please contact IPGRI Regional Office in Serdang, Malaysia (Dr Percy Sajise, Regional Director, p.sajise@cgiar.org or Dr Jarkko Koskela, Associate Scientist, j.koskela@cgiar.org) or APAFRI Secretariat in Kuala Lumpur, Malaysia (Dr Daniel Baskaran, Executive Secretary, baskaran@frim.gov.my or Dr Lim Heok Choh, Executive Director, sim@apafri.upm.edu.my).

Publications


Further information on the workshop in Thailand can be obtained from: Dr. Pundit Ponoy, Project Director, FORGENMAP/Royal Forest Department, Thailand (forgenmap@forest.go.th) or Dr. Jarkko Koskela, Associate Scientist, IPGRI Regional Office for Asia, the Pacific and Oceania, Malaysia (j.koskela@cgiar.org).

In situ conservation of Pinus merkusii

Photo: Jarkko Koskela
he first workshop of the International Training Programme on Conservation and Management of Forest Genetic Resources (FGR) in Eastern Europe was held in Gmunden, Austria from 29 April to 12 May 2001. It was jointly organised by the Federal Ministry of Agriculture and Forestry, Environment and Water Management (BMLFUW) of Austria and IPGRI in technical collaboration FAO. The two-week workshop was attended by 22 young scientists and practitioners from 15 countries (Belarus, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Macedonia FYR, Moldova, Poland, Romania, Russian Federation, Slovenia, Ukraine, Yugoslavia). The workshop was organised as a contribution to the implementation process of international resolutions from the Ministerial Conferences for the Protection of Forests in Europe.

The overall objective of this training programme is to improve conservation and to promote sustainable use of forest genetic resources in eastern Europe. Research and evaluation of genetic resources and tree breeding have a long tradition in these countries. The future of FGR conservation, however, is under serious concern due to enormous challenges, which are related to include institutional structures, coordination, technology and human resources. During this workshop, the trainees were provided with an overview of basic principles of conservation genetics and their practical application in forest management. Topics included molecular genetics, evolutionary genetics, in situ and ex situ conservation strategies and techniques and provenance research. A number of case studies on important European trees species were used to illustrate the current state of conservation and genetic knowledge. Legal and policy aspects of FGR conservation at the European and global level were also covered.

In addition to the training material prepared for the workshop, the trainees had a unique opportunity to meet scientists from different institutions throughout Europe and to create links for future cooperation. They also obtained access to information that is not readily available in their own countries and the opportunity to discuss their specific research and technical needs in working groups. In view of the positive results obtained, the organisers have decided to go ahead with the second training workshop, which will concentrate more on applied aspects of gene conservation and will be held in Austria in 2002.

For further information please contact Jozef Turok, IPGRI (j.turok@cgiar.org) or Thomas Geburek, FBVA (thomas.geburek@fbva.bmlf.gv.at).

The lecturers at the workshops were: L. Ackzell (Sweden), W. Amaral (IPGRI), S. Borelli (IPGRI), A. Buck (LU/MCPFE), J. Engels (IPGRI), G. Eriksson (Sweden), G. Frank (Austria), Th. Geburek (Austria), H. Hasenauer (Austria), H. Hattemer (Germany), B. Heinze (Austria), R. Klumpp (Austria), G. Koch (Austria), K. V. Krutovskii (USA), Cs. Mátyás (Hungary), F. Müller (Austria), C. Palmberg-Lerche (FAO), L. Paule (Slovakia), M. Pregernig (Austria), K. Schadauer (Austria), S. Schanil (Austria), M. Schneider (Austria), J. Turok (IPGRI) and E. Wilhelm (Austria).

IPGRI joins the Asia Pacific Association of Forestry Research Institutions

In April 2001, IPGRI formally joined the Asia Pacific Association of Forestry Research Institutions (APAFRI). The two institutions have earlier exchanged ideas on FGR conservation and use since early 2000 when IPGRI’s FGR programme based its first staff members to the region. IPGRI was welcomed as a new member during the 8th meeting of the APAFRI Executive Committee held in Chiang Mai, Thailand on 10 May 2001. APAFRI was formally established in a regional meeting of heads of forestry research institutions held in Bogor, Indonesia in 1995. Prior to this, the Forest Research Support Programme of Asia and the Pacific (FORSIPA) at the FAO Regional Office in Bangkok had initiated an effort to coordinate a number of informal forestry research networks that already existed in the region. APAFRI aims at increasing forestry research capacity in the region by fostering institutional and professional collaborations among the member institutions from 23 countries.

APAFRI is open to all interested institutions that are active in forestry research and offers a number of services to its members, such as dissemination of information and publications, maintenance of a regional database on forestry research, and facilitation of meetings and training workshops. For more information, please contact APAFRI at:

Asia Pacific Association of Forestry Research Institutions
c/o Forest Research Institute Malaysia
Kepong, 52109 Kuala Lumpur, Malaysia
Web page: http://www.apafri.org/
E-mail: secretariat@apafri.upm.edu.my
Tel. +60-3-6272 2516, 6277 3207;
Fax +60-3-6277 3249
The Panel of Experts on Forest Genetic Resources was established in 1968 at the request of the Fourteenth Session of the FAO Conference (1967), with a mandate to "help plan and coordinate FAO’s efforts to explore, utilize and conserve the gene resources of forest trees and, in particular, help prepare detailed short- and long-term programmes of action, and to provide information to Member Governments".

The Panel meets every two years. It reports on the state of forest genetic resources activities in the various regions covered by each of them and reviewed global developments and the work of FAO in the past biennium.

The Panel passed a number of specific recommendations and stressed the need to continue to raise awareness of the social, economic and environmental benefits of conservation and wise utilization of forest genetic resources, and of the direct and indirect contributions, which such action made to national and rural development. It stressed the need to further emphasize the compatibility of conservation and genetic management with the managed utilization of forest resources to meet present-day as well as future needs.

The main recommendation concerned the following point: (a) the support to national institutes in the development and implementation of forest genetic resources programmes and support to institutional networking and twinning, (b) the further development, dissemination and adaptation of methodologies and pilot activities in the conservation and sustainable use of forest genetic resources, (c) the facilitation of exchange of technologies and forest reproductive materials, (d) the dissemination of information on benefits and potential adverse effects of the use and application of new biotechnologies; and on access, benefit-sharing and biosafety, (e) the provision of up-to-date information on the state of the world’s forest genetic resources (REFORGEN), (f) the raising of awareness of forest genetic resources issues and their impacts and benefits.

The Panel updated the list of priority species for each region, which together with a number of specific technical recommendations will be available in the Report of the Panel’s Twelfth Session, expected to be published in early 2002.
IPGRI PUBLICATIONS

MANAGING PLANT GENETIC DIVERSITY
The proceedings of the conference on Science and Technology for Managing Plant Genetic Diversity in the 21st Century.
GRST (Genetic Resources Science and Technology Group), IPGRI (International Plant Genetic Resources Institute), CABI Publishing, UK

FOREST GENETIC RESOURCES CONSERVATION AND MANAGEMENT: VOL. 2

BROADENING THE GENETIC BASE OF CROP PRODUCTION
H.D. Cooper, C. Spillane and T. Hodgkin, 2001
CABI (Cab International), FAO (Food and Agricultural Organization of the United Nations), GRST (Genetic Resources Science and Technology Group), IPGRI (International Plant Genetic Resources Institute).

PROCEEDINGS OF THE SOUTHEAST ASIAN MOVING WORKSHOP ON CONSERVATION, MANAGEMENT AND UTILIZATION OF FOREST GENETIC RESOURCES,

CONIFERS NETWORK
Report of the first meeting, 22-24 March 2000 - Brdo/Kranj, Slovenia
J. Turok, Cs. Mitsyas, B. Fady and S. Borelli (compilers), 2001
EUFORGEN (European Forest Genetic Resources Network), EUR (Regional Office for Europe).

EUFORGEN
Mediterranean Oaks Network
Report of the 1st meeting, 12-14 October 2000, Antalya, Turkey
S. Borelli and M.C. Varela (compilers), 2001
EUFORGEN-HO (EUFORGEN - Mediterranean Oaks), EUR (Regional Office for Europe).

EUFORGEN
Social Broadleaves Network
Report of the 3rd meeting, 22-24 June 2000 - Borovets, Bulgaria
EUFORGEN-SB (EUFORGEN - Social Broadleaves), EUR (Regional Office for Europe).

SEEDING SOLUTIONS. Volume 2.
Options for national laws governing control over genetic resources and biological innovations
The Crucible II Group, 2001
DHF (Dag Hammarskjöld Foundation), IDRC (International Development Research Center), IPGRI (International Plant Genetic Resources Institute).

PROGRAMME DE RESOURCES GÉNÉTIQUES FORESTIÈRES EN AFRIQUE AU SUD DU SAHARA
(Programme SAFORGEN)
Réseau “Espèces Ligneuses Médicinales”. Compte rendu de la première réunion du Réseau 15-17 Décembre 1999 Station IIITA Cotonou, Benin
O. Eyog Matig, E. Adjanaounhoun, S. de Souza et B. Sinsin (eds), 2001
BAD (Banque Africaine de Développement), CENPREBAF (Centre Pilote Régional de la Biodiversité Africaine), IPGRI (International Plant Genetic Resources Institute), UNEP (United Nations Environment Programme).

IN SITU CONSERVATION OF POPULUS NIGRA
EUFORGEN-Pn (EUFORGEN - Populus nigra Network), EUR (Regional Office for Europe).

PLANT GENETIC CONSERVATION AND USE IN CHINA
Proceedings of a National Workshop on Conservation and Utilization of Plant Genetic Resources, 25-27 October 1999, Beijing, China
Weidong Gao, V. Ramanatha Rao and Ming-De Zhou (eds), 2001
EAS (Office for East Asia), ICGR-CAAS (Institute of Crop Germplasm Resources, Chinese Academy of Agricultural Sciences).

NEWS
IPGRI is pleased to announce the launching of a fellowship scheme in memory of Dr Abdou-Salam Ouédraogo. Dr Ouédraogo led IPGRI’s forest genetic resources programme from 1993-1999. As IPGRI Director for Sub-Saharan Africa he ably led the institute’s activities in the region until his untimely death in a plane crash in January 2001. As founding Director of the Forest Tree Seed Centre in Ouagadougou and Coordinator of the FAO/CILSS regional forest genetic resources programme he made a tremendous impact nationally and regionally, taking his skills to the international level through serving on various FAO, CIRAD-Forêt, IUFRO and IUCN committees. Dr Ouédraogo left an indelible mark on IPGRI and the world forestry community as a whole. At the time of his death he was exploring ways to bring young Africa scientists into the international research environment; his ideas are incorporated into the Abdou-Salam Ouédraogo Fellowship Scheme.

Applications are invited from scientists from Sub-Saharan Africa to work with IPGRI in one of the institute’s locations in Africa (Nairobi, Cotonou, Douala, Kampala) for a period of up to six months. IPGRI would support the travel, subsistence and research expenses of the Fellow up to a sum of US$10,000. The fellowship can be combined with other awards.

The proposed work should fall into the broad area of conservation and use of genetic resources. In the first year of the Fellowship Scheme, preference will be given to proposals with a forestry emphasis. The work should link to or complement IPGRI’s research programme, details of which can be found at http://www.ipgri.cgiar.org. Proposals that link IPGRI’s work to that of other research and development institutes in Africa will be particularly welcome.

The application forms can be downloaded from: http://www.ipgri.cgiar.org/regions/ssa/documents/ASOApplicationform2002.doc

Applications accompanied by a letter of application and full curriculum vitae should be submitted to the address indicated by 31 March 2003. Applications will provide the basis for a pre-selection. A short-list of pre-selected candidates will be invited to develop more detailed proposals from which the final selection will be made.

For more information please contact:
Issiaka Zoungrana, Training Officer.
IPGRI-SSA C/o ICRAF
P. O. 30677, Nairobi Kenya.
Email: I.zoungrana@cgiar.org
The mandate of the International Plant Genetic Resources Institute is to advance the conservation and use of plant genetic resources for the benefit of present and future generations. IPGRI works to develop improved methods for conserving plant genetic resources and to ensure that the diversity present in agricultural crops, their wild relatives and forest tree species is safely maintained. The Institute recognizes the need for sound, scientifically-based conservation strategies, in keeping with the goals of the Convention on Biological Diversity.

IPGRI has three main objectives that describe the goals of its work:

- strengthening national programmes;
- contributing to international collaboration;
- developing and disseminating knowledge and technologies relevant to the improved conservation and use of plant genetic resources.

IPGRI is a Future Harvest Centre Supported by the Consultative Group on International Agricultural Research (CGIAR)