

THE EUROPEAN FOREST GENETIC RESOURCES PROGRAMME (EUFORGEN) AND ITS FIRST ACTIVITIES

Jozef Turok & Emile A. Frison

IPGRI, Regional Office for Europe, Via delle Sette Chiese 142, I- 00145 Rome, Italy

The genetic diversity of European forests, while it has attracted far less attention than the tropical rainforests, has proven to be particularly vulnerable due to the recent forest decline. Concern about European forests rose to ministerial level in 1990 at the first Ministerial Conference for the Protection of Forests in Europe held in Strasbourg. That conference recommended the development of a flexible mechanism to coordinate the conservation efforts of individual countries. A follow-up committee of Resolution 2 initiated an international survey on the present status of forest genetic resources in Europe and prepared the basis for collaboration in networks. The International Plant Genetic Resources Institute (IPGRI), together with the Food and Agriculture Organization of the United Nations (FAO), then proposed the establishment of the European Forest Genetic Resources Programme. The Programme was endorsed by the second Ministerial Conference (held in Helsinki in 1993) and became operational in October 1994.

The main activities of EUFORGEN are concentrated in species networks. Four pilot networks were initially suggested for collaboration, based on the response of European countries to the survey conducted by the follow-up committee of Resolution 2. The selected set of species not only reflected national priorities for the conservation of most threatened genetic diversity at a species level, but it also covered different types of distribution patterns and different reproductive systems.

Two meetings of each *Quercus suber* and *Populus nigra* networks, and first meetings of the *Picea abies* and the noble hardwoods networks have been held so far. The networks have chosen a similar approach to many common problems and tasks with the species concerned. Their activities focus on inventories of genetic resources, development of joint databases and lists of descriptors, identification of common research needs, efforts to submit joint project proposals, development of joint conservation strategies and guidelines, and promotion of the establishment of national gene reserve forests and complementary measures as part of national conservation programmes. Network members and other scientists and forest managers from participating countries meet and work together to analyze countries' needs, exchange experiences, develop joint activities and carry out an agreed work plan with their own resources as inputs in kind to the Programme.

Members of the *Populus nigra* network produced an identification sheet of traits for easy distinction of the species from Euramerican hybrids and introgressive forms. A proposal for passport data as well as a selected bibliography were published within the report of the first meeting and a list of common descriptors has been developed. The network participants also completed a synthesis of *in situ* conservation systems applied to *Populus nigra* and will set up a common

database. A core collection of clones representing the whole distribution area of the species in Europe is currently under establishment. The collection will serve as a common reference for characterization and evaluation of national collections, including genetic studies.

Two *Quercus suber* network meetings resulted in the development and submission of two project proposals to the European Commission. The concerted action project will provide a conceptual basis for coordinated activities of the group, including exchange of material. A priority of the network is to undertake a full inventory of genetic resources.

The first *Picea abies* network meeting was attended by participants from nine countries and a further four countries sent their contributions. One of the first tasks accepted by the network was to describe the status of genetic resources conservation in both west and east Europe, and the situation in individual countries was presented. All country reports were published in the report of the meeting. A list of descriptors was developed in consultation with members of the network. It was also agreed to produce a technical manual for forest officers and decision-makers, which provides practical guidelines for the conservation of *Picea abies* genetic resources.

The EUFORGEN noble hardwoods network met for the first time in March 1996. In spite of the varying importance of individual species in different countries, several common features were identified and an inclusive list of species for collaboration developed. Lack of genetic knowledge is still a major constraint to the development of effective national gene conservation programmes. The network tasks include, as a priority, to produce a long-term conservation strategy for noble hardwoods in a European perspective, to identify genetic inventory requirements, to publish reviews of literature, to prepare guidelines for the conservation of genetic resources of rare and minor noble hardwood species, and to coordinate activities on research and databases.

Besides the species networks, EUFORGEN aims at providing a contribution to international collaborative initiatives, facilitating the information flow among countries and raising public awareness. The Steering Committee of EUFORGEN is composed of national coordinators nominated by the participating countries and has the overall responsibility for the Programme. According to the recommendation endorsed by the Steering Committee at its first meeting in November 1995, EUFORGEN should serve as the platform for the implementation of the forest genetic resources components of the FAO Global Plan of Action in Europe. Considering this new opportunity, the Steering Committee agreed to open up the existing four pilot networks to include other species. A new network on 'social broadleaves' (European oaks and beech) was also initiated by the Steering Committee. The national coordinators confirmed the strong interest of

their countries in the international collaboration and stressed that providing guidance for the development of national policies and encouraging activities on forest genetic resources continue to be among the most important objectives of the Programme. Immediately following the Steering Committee meeting, a one-day workshop addressing important European forest genetic resources issues was convened by EUFORGEN. Delegates from 28 countries attended the Workshop and provided a forestry-focused input of European countries to the preparatory process leading up to the International Technical Conference of FAO on Plant Genetic Resources (to be held in Leipzig, Germany, in June 1996).

Further information and the following publications are now available from IPGRI, Regional Office for Europe, Via delle Sette Chiese 142, I-00145 Rome, Italy:

Populus nigra Network. Report of the first meeting, 3-5

October 1994, Izmit, Turkey. IPGRI, Rome. 52 pp.

Picea abies Network. Report of the first meeting, 16-18 March 1995, Stará Lesná, Slovakia. IPGRI, Rome. 96 pp.

Quercus suber Network. Report of the first two meetings, 1-3 December 1994 and 26-27 February 1995, Rome, Italy. IPGRI, Rome. 41 pp.

EUFORGEN Report of the Steering Committee. First meeting, 19-20 November 1995, Sopron, Hungary. IPGRI, Rome. 27 pp.

Populus nigra Network. Report of the second meeting, 10-12 September 1995, Casale Monferrato, Italy. IPGRI, Rome. 29 pp.

Proceedings of the European Forest Genetic Resources Workshop. 21 November 1995, Sopron, Hungary. IPGRI, Rome (in press).

INTERNATIONAL BOREAL FOREST GENETIC RESOURCES WORKSHOP

Jozef Turok

IPGRI, Regional Office for Europe, Via delle Sette Chiese 142, I-00145 Rome, Italy

A workshop devoted to the genetic resources of boreal forests was held from 19 to 22 June 1995 in Toronto, Canada. Organized by a team from the Petawawa National Forestry Institute, Canadian Forest Service, it succeeded in bringing together scientists and policy makers from 20 different countries, among them 13 European. The aim of the workshop was to assess the current status of conservation activities in boreal forest genetic resources and to develop recommendations for their future management and conservation. The presence of both scientific expertise and understanding capacity for policy and administrative issues related to the conservation and sustainable use of genetic resources was certainly one of the keys to the success of the meeting.

The 'Canadian workshop' was organized in technical collaboration with the FAO Forestry Department, providing an input to the International Conference and Programme on Plant Genetic Resources (ICPPGR). Two major documents, concerning State of the World's Plant Genetic Resources and Global Plan of Action will be discussed at the International Technical Conference (in Leipzig, Germany, June 1996). The FAO has facilitated a participatory, country-driven process to develop the documents. Countries prepared official reports on the conservation and use of plant genetic resources, including forest genetic resources. A series of meetings and workshops was organized during the preparatory process.

The experience of Canada in initiating and leading international efforts to conserve forest genetic resources was recognized by the workshop participants. The importance of further research for planning conservation activities in the boreal zone was highlighted in the introductory session by Professor G. Namkoong from the University of British Columbia. One of the main problems to resolve is the balance between local and global adaptation processes. In large

widespread populations of typical boreal tree species, migratory forces are thought to have a big impact on local adaptation. He mentioned the multiple breeding strategy and presented a possible approach to defining priorities among conservation activities.

Each country presented a brief overview of its boreal forests and their genetic resources, highlighting major commercial and non-commercial species, their utilization, vulnerability, current and planned gene conservation measures, national programmes and legislation, as well as needs and opportunities. A rather broad definition of boreal forests was used, including characteristic boreal trees utilized outside the strictly boreal zone, and temperate species occurring within the boreal zone. Since different countries focused on different aspects, an unbiased first profile of the gene conservation work in boreal forests was uneasy to obtain. The participants then divided into four smaller groups to discuss several key issues.

It was recognized by all working groups that, due to the biological properties and genetic processes in boreal forests, all sudden population declines pose a great threat to the preservation of genetic variation. The common concern across boreal regions is with fragmented populations and small population sizes. Main regional concerns vary from the negative impacts of harvesting practices (*e.g.*, China, Chile and Northern America) to the effects of air pollution in Central Europe. Concern with threats to genetic diversity at a species level was most frequently expressed by China and Japan.

Major constraints to genetic conservation were discussed in the working groups, which focused on developing concise recommendations. One constraint common to all countries is the difficulty to design proper conservation strategies. To

overcome this, further knowledge is needed about species biology and population genetics, as well as improved cooperation. Research topics were ranked according to their priority for financial support. It was agreed that studies on genetic structure and variation are very important ones and that great attention should be paid to the link of research results with practical conservation. While international collaboration in the area of information exchange, training and other networking activities are commonly demanded to support conservation efforts, the importance of good communication at a national level was also mentioned. EUFORGEN was referred to as an example of regional multilateral collaborative programme among European countries.

A further constraint is related to the implementation of effective conservation programmes. Due to the lack of national programmes in many countries, it was strongly recommended that all countries develop a strategy for conserving forest genetic resources and ensure its implementation. National strategies should, as a minimum, address the species of concern, methods to be applied and organizations involved. Through international cooperation, countries which have not yet developed a national programme could benefit from operational programmes in other countries and their complementarity would be beneficial to all.

A multidisciplinary approach to forest genetic resources should be enhanced. Non-commercial species should receive greater attention. Generally insufficient funding of the genetic conservation measures is considered as a serious constraint to the implementation of efficient conservation programmes. It was recommended that national and particularly international organizations further emphasize public awareness and increase efforts to highlight the importance of genetic conservation in boreal forests.

Finally, the State of the World Report on Boreal Forest Genetic Resources and the Recommendations for the Global Plan of Action, which are to be presented at the International Technical Conference, were adopted by the plenary. The report of the workshop, along with both documents, will be published later in the year. The 'Canadian workshop' demonstrated that the level of knowledge about boreal forest genetic resources is comparably high, and that the increasing vulnerability of boreal ecosystems is also known. It has provided an important contribution to the ICPPGR, a process pre-vaillingly driven by the agricultural sector. Thanks to the organizers from Petawawa and to the facilitating role of Dr T. Boyle from the Centre for International Forestry Research (CIFOR), it has been proved that boreal conservation issues deserve urgent attention.

GENETIC DIVERSITY STUDIES ¹

Introduction

Tropical forest genetics has two major goals which have to be considered both in research and in the application of research results in development: *conservation* and *domestication*. The present report focuses on research needs. However, it is also understood that research and development are activities which have much in common and that EU-supported research in this field must always be problem-oriented for future forest conservation or management.

Genetic studies in the forestry context traditionally focus on *forest trees*. Conservation of genetic resources of forest trees and other woody species is closely related to all other forms of diversity and is essential for sustaining the productive and protective values of the forest; managed production forest play a key role in programmes aimed at the conservation of genetic resources and are necessary complement to conservation efforts undertaken through protected area management (FAO 1993).

However, it is acknowledged that the whole domain of tropical biological diversity needs attention and that the genetic aspects of other components that trees also warrants urgent research especially when they lead to better management, conservation, and land-use practices.

A general principle which has to be followed in genetic diversity studies is that the involvement of all factors in the design and conduct of research can ensure better research results and their effective implementation. Wherever possible, formulation of research should be guided by the priorities identified by those who depend on forests and trees for their livelihoods.

The present report was compiled with the understanding that it will not cover all possible aspects relevant to genetic diversity studies. The main objective was to highlight some important topics related to genetic diversity in which urgent research is needed and which fall under Activity 2 (INTERCOOP) of the present Fourth Framework Programme (1994–1998) for Research, Technological Development and Demonstration (RTD) of the European Union.

Genetic Diversity Studies Related to Conservation

Taxonomy. Approaches to taxonomic research have changed dramatically over the past few years with the advent of molecular techniques to aid determination and provide new evidence of taxonomic boundaries. This has meant that a significant amount of earlier work is now considered incomplete and in need of updating. Coupled with this is a growing demand for taxonomic studies on taxa with economic impor-

¹⁾ EU/ETFRN Expert Group Meeting being held in Helsinki on March 17, 1995. Participants and editors of the present report were: H. Freiberg (ETFRN Coordination Unit, Bonn, Germany), A. Pottinger (OFI, Oxford, United Kingdom) and O. Luukanen (University of Helsinki, Finland). Written comments were obtained from the following colleagues: T. Boyle (CIFOR), J. Burley (OFI), B. Ditlevsen (DANIDA Forest Seed Centre), P. Kanowski (OFI), and R. Sardinha (EFN, Lisbon).

tance. Such work is an essential forerunner of any domestication programme by providing an accurate means of differentiating between seed sources.

Approaches to supporting taxonomic research should stress the need to provide collaboration and partnership for taxonomists from tropical countries in the EU.

Studies are also required to look at means of interpreting the data which are being produced by studies using molecular markers to study genetic differentiation in order to understand how the recorded variation is exhibited in the growing trees.

There has been a distinct lack of "user friendly" outputs from many taxonomic studies, and an area of high priority is to produce research outputs in a form which is available to the field worker or non-taxonomic researcher. Obvious examples are field guides (translated into local languages) and databases which can support taxonomic information.

Reproductive biology and population genetics. Special attention and priority may have to be given to the conservation of forest genetic resources in certain areas of the productive forest estate, for example at the edges of a species' geographical or ecological range, where the populations are likely to be genetically distinct, and where they may be particularly vulnerable to disruption (FAO 1993).

Conservation programmes depend upon an ability to safeguard viable populations of the species in question which in turn requires knowledge of breeding systems and patterns of gene flow, both spatial and temporal. The basic reproductive biology and population genetics of tropical trees is poorly known, which clearly has severe implications for *in situ*, *ex situ* and *circa situ* (achieved in production systems) conservation programmes.

Components of biological diversity should be monitored so as to develop appropriate conservation and sustainable use strategies for tropical forest ecosystems. In this context, the dynamics of the tree species composition in natural forest ecosystems which are degraded and in need of active rehabilitation or restoration should be studied and suitable sampling procedures established by appropriate national institutions. Standardized techniques and comparable predictive models must be developed for ensuring sharing and analysis of the information gathered.

Customary use for components of biological diversity. Research is needed on customary uses of tropical forest ecosystems (which in many cases have been essential in forest resource conservation) in relation to their richness of tree species and other components so as to ensure appropriate conservation strategies and a continuing sustainable use of the resources. This will require cooperation between biologists, anthropologists, economists and, in some cases, medical or pharmaceutical specialists.

Genetic Diversity Studies Related to Domestication

Intensive management of natural forests. The knowledge needed for intensive management of natural forest draws heavily on the studies required for successful forest conservation. Logging is at present the only large-scale management intervention in the tropical forest. It may either reduce or enhance species and inter-specific diversity. It may furthermore contribute to the depletion or conservation of the genetic resources of the principal species being utilized,

depending on the timing, intensity, frequency and discrimination employed, and on the effectiveness of protection and management of subsequent regeneration. Rare populations and species of trees characteristic for the later successional stages have earlier been tentatively suggested as needing special attention, as well as the species used for non-timber products (FAO 1993).

Special ecological taxonomic, or other advice may be needed in relation to conservation concerns, for example, in the location and distribution of seed trees, or patches of forest to be left unlogged, to ensure regeneration and maintenance of desirable levels of inter- and intra-specific diversity (FAO 1993).

Trees in farming systems. Research should be directed on the specific genetic diversity problems related to trees in farming systems, including sustainable utilization and *in situ*, *ex situ* and *circa situ* conservation of indigenous tree species. The natural woody vegetation and its utilization especially on drylands and as the basis for livestock management also needs the support from further forest genetic research.

Plantations. The greatest gains in productivity in both tree plantations and agroforestry are made from correct choice of species and provenances. Trees are planted increasingly for other than industrial purposes, and species selection for plantations commonly includes less-known and indigenous species.

Research programmes should be supported which aim to make comprehensive, well documented collections of seed of species with economic value, including the multiple-purpose and nitrogen-fixing trees and shrubs suitable for agroforestry. Centrally-coordinated evaluation programmes have been shown to be the only viable, reliable, and cost-effective approach to germplasm testing involving sites in several countries. Such programmes should aim to evaluate species in terms of a range of outputs, and look at interactions with environmental factors, such as soil and microsymbiotic associations.

Research is required into multiplication system designing, *e.g.*, to produce sterile lines of exotic species which may pose threats of invasiveness. The production of seed from orchards of multipurpose trees used in agroforestry also requires knowledge of breeding systems. Support should be provided for focused studies of the breeding systems and patterns of gene flow of planted tree species showing economic, amenity or conservation value.

Urban and peri-urban forestry is already expanding without proper genetic research on suitable woody plant species; this should be corrected by new innovative research efforts.

Growers needs and how they gain access to seed have to be examined in much greater detail requiring interdisciplinary studies with socio-economists. Similarly, means of improving the uptake of results from research and development programmes ought to be investigated.

References

- FAO 1993: Conservation of genetic resources in tropical forest management: principles and concepts. FAO Forestry Paper 107. FAO, Rome.