ASEAN-EU University Partnership Programme (AUNP): Conservation and Sustainable Utilization of Plant Genetic Resources in SE-Asia

Minutes of the Preparation Workshop ”The role of molecular and traditional tools to evaluate plant genetic resources” Bogor, September 15-18, 2003

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A preparation workshop for the forthcomming project “Conservation and sustainable utilization of plant genetic resources in SE-Asia” within the ASEAN-EU University Network Programme (AUNP) was conducted in Bogor from September 15 – 18, 2003. Two days of lectures and presentations were followed by a two-day excursion to Darmaga Experimental Garden, Bogor Botanical Garden, and Gunung Walat Experimental Forest. These minutes summarize the technical presentations of the first two days of the meeting, which were divided into four sessions.

Session 1 (Chair: Arti Prat)

The speakers in the first Session of 1st AUNP regional workshop were Reiner Finkeldey, Professor of Forest Genetics and Forest Tree Breeding, Goettingen University (Germany), Tapio Luoma-aho, IPGRI Associate Scientist in South East (SE) Asia branch office (Malaysia), Daniel Prat, Professor of Plant Biology, University Claude Bernard Lyon I (France), and Iskandar Siregar, Lecturer of Forest Genetic and Silviculture, Faculty of Forestry, Bogor Agricultural University (Indonesia).

R. Finkeldey talked about generality of forest genetic resources (FRG) in SE Asia, its status, importance, and threats. The speaker showed some characteristics of tropical FGR, taking some examples on effects of forest disturbance in a dipterocarp forest and underlined different strategies that may be adopted to conserve and manage tropical FGR, using an example of *Pinus merkusii*.

In his first speech, T. Luoma-aho presented the activities of IPGRI on conservation of FGR thru partnership and networking among national partners. In SE Asia IPGRI developed networking especially in neem, rattan and bamboo, provided fellowships for graduate research thru Vavilov-Frankel Foundation, located and monitored FGR of high priorities according to basic considerations, developed strategies and policies for conservation and sustainable use of FGR, developed complementary conservation strategies of FGR for species of priorities.

D. Prat talked about institution profile : Higher Plant Genome and Evolution Laboratory, as one of the partners in the project, and how it can contribute to achievement of project goals. The laboratory activities were focused on lectures and research. Research activities were focused mainly on hybridisation and plant evolution, the impact on phylogeny, nuclear and cytoplasmic genomes, polyploids, and genome implication. Two groups of plant were used for that purpose, rose and gymnosperm (pinus genus and podocarpaceae family). Rose domestication was chose for quick and oriented evolution (perfume genetic control, plant architectural and phylogeny), while gymnosperm evolution was used for homoploid speciation both at cloroplast, mitochondral and nuclear genes.

I. Siregar emphasized on role and contributions of Faculty of Forestry, Bogor Agricultural University (FFIPB) on sustainable management of FGR in Indonesia, and its expectations from AUNP project for human resources and research facilities development. FFIPB offered higher educations (bachelor, master and PhD degrees), applied research as well as community services. FFIPB is one of the oldest faculty of forestry in Indonesia, and almost in each Indonesian province there is one public FF or forestry department under Faculty of Agricultural. There are also some FF under private university. During the period 1993-2002, number of forestry graduates (bachelor, master and PhD degrees) increased for both the two sexes. However, since and during the economic crisis in 1997, many foresters could not find suitable jobs as easy as before, as forestry sector was terribly suffered. Meanwhile, foresters role and forestry mentality have also changed from exploitation to conservation. This has significant impact on curiculum development and even on the name of study program. Nowadays, only foresters with special qualification in special subject area such as forest tree breeding could find suitable jobs.

T. Luoma-aho, in his second speech, talked about IPGRI activities to coordinate postgraduate education in Plant Genetic Resources (PGR). However, in PGR education program, the principal weakness were lack of coordinated and holistic approach, noteworthy lack of networking and weak national program. IPGRI coordinated post graduate collaboration in PGR program, by developing Master degree in PGR (MSPGR) in several countries. IPGRI tried also to develop distance education for master degree in PGR, this program is specially designed for those employed in remote area.

Session 2 (Chair: Ludger Leinemann)

This session dealt mainly with the application of molecular tools to assess genetic variation in forest tree populations.

The first presentation with the title "Molecular Tools for the Conservation of Forest Genetic Resources" held by Oliver Gailing gives a detailed overview of biochemical and molecular markers. Basic methodical principals were explained and main properties of each marker type were summarized.

In the second presentation Evelyn Martell talked about "Application of Phylogenetics in Plant Conservation". The application of molecular techniques in this field was demonstrated and various approaches of data analysis were explained. She pointed out that phylogenetic analyses are of particular interest in Plant Conservation to investigate evolutionary process i.e. evolutionary relationships among species. Concerning conservation issues such informations are important for example to understand hybridisation events or to facilitate breeding programs.

Ulfah Siregar talked about "Applications of molecular Tools in conservations and breeding of tree species in Indonesia". Ulfah Siregar underlined, that the decline of forest area and degradation of forest resources has generated a strong call for conservation and reforestation. She explained that the maintenance of ecosystems requires also the maintenance of genetic and biological processes. Therefore genetic investigations on the basis of molecular tools are of fundamental importance to develop conservation and reforestation programs. The application of molecular tools was demonstrated with several case studies e.g. influence of logging on the genetic diversity of two *shorea* species, monitoring of genetic diversity and genetic differentiation of mangrove species from Java and Sumatra. It appears that molecular tools can accelerate conservation and tree improvement programs.

The title of the presentation of Reiner Finkeldey was "Molecular tools to measure patterns of genetic variation". In the first part he explained the most common genetic parameters to describe discrete molecular variation patterns and how they are used to analyse genetic variation within and among populations. The application and interpretation of these parameters was demonstrated by various case studies e.g. Genetic variation in *Acacia* *auriculiformisin* Papua New Guinea, Genetic variation of *Dalbergia sissoo* in Nepal. In his general conclusions Reiner Finkeldey underlined the importance of genetic inventories to assess the evolutionary adaptive potential of plant populations.

Session 3 (Chair: Reiner Finkeldey)

The session dealt with several approaches to evaluate and to conserve plant genetic resources.

Successful conservation programmes depend on the involvement of main stakeholders such as Perum Perhutani, the state-owned enterprise managing most of the forest on Java. Mr. Sadhardjo Siswamartana from Perum Perhutani described activities of his company for the exploration and conservation of forest genetic resources (FGR) with emphasis on teak. He pointed out that utilization and conservation of FGR are complementary activities, and that conservation activities are integral part of sound breeding programmes. The genetic base of many species, in particular of introduced tres, is insufficient to start breeding. In Indonesia and in particular on Java the demand for wood exceeds by far the supply. Thus, plantation forestry and tree improvement will continue to be of great importance for the development of sustainable forestry practices.

Mrs. Sofi Mursidawati from Bogor Botanical Garden took the example of Indonesian orchids to point out the rich biodiversity of Southeast-Asia. Species extinction is not only a threat for a distant future, but is an ongoing process. The knowledge on many species is very limited reducing the chance to initiate activities for their survival. A lack of funding and well-qualified researchers are main obstacles for efforts to conserve endangered plants.

Tajudin Edy Komar and Hesti Lestari Tata highlighted the importance of *ex situ* plantations to conserve FGR. Experimental gardens were established in several locations on Java for the simultaneous exploration and conservation of genetic resources on Indonesian dipterocarps. These *ex situ* plantations are also important for studies on the reproductive biology of forest trees.

Ludger Leinemann explained methods to analyze the reproduction system of forest trees based on gene markers taking examples from studies conducted in Southeast-Asia. Reproduction is the phase of highest temporal dynamics of genetic structures in the life cycle of forest trees, and, in consequence, genetic resources are sensitive to disturbances of the gene flow and the mating system. The knowledge of the reproduction system of a species and environmental factors affecting its dynamics is cucial for the development of conservation programmes.

The evaluation of adaptive potentials of forest trees was pinpointed as an important task for tree breeders and conservationists by Daniel Prat. The establishmnent and analysis of properly designed field trials continues to be indispensable in this context. Complex variation patterns both among and within provenances are encountered for adaptive traits, and traditional breeding methods based on field trials (for example, provenance tests, progeny tests, clonal tests) and quantitative genetic tools are neither trivial nor outdated in order to assess adaptive trait variation of forest trees.

In summary, it appeared that threats to FGR are manyfold involving alterations of land use, forest destruction, not sustainable management of forests, and many other human activities in developing countries. Conservation of plant genetic resources needs inputs from many different fields, and a proper coordination of activities such as conservation *in situ* and *ex situ* is as important as a careful setting of priorities. In many cases, an innovative method will not substitute a traditional tool, but will allow additional insights. Thus, innovative, molecular tools to evaluate FGR do not substitute, but complement traditional methods such as the establishment of field trials.

Research, for example on the reproductive biology of tropical forest plants or on patterns of adaptive variation, is not an expensive luxury, but a necessary component of efficient conservation strategies. In view of the limited manpower available in this field the focus of the AUNP project "Conservation and Sustainable Utilization of Plant Genetic Resources in SE-Asia" on human resource development is well-justified.

Session 4 (Chair: Ulfah Siregar)

Session IV, which is the last session of the workshop is continuation of the previous session and devoted to conservation and breeding program conducted by several Indonesian institutions.

First presentation on conservation and breeding program in Indonesia was given by Winaya Mukti University (Unwim), which outlined their research program on suren (*Turian sinensis*). This species is considered as economically less important tree species, because used mainly by local community. Intensive and extensive exploitation has made suren an endangered species. Suren is known to be difficult to cultivate due to difficulty in adaptation to new environment. Research works includes biology of reproduction, seed technology, propagation and cultivation, as well as its genetics.

In the following presentation Daniel Prat from University of Lion introduced ATL (Adaptive Trait Loci) as one of traits to be considered in a conservation program. The difference between ATL and QTL was explained, as well as the strategy and methodology to study this trait.

The next presentation was given by Faculty of Forestry, IPB (Bogor Agricultural University) on conservation policy of MoF (Ministry of Forestry) in relation with seed procurement/supply. Category of species to be conserved is: 1) locally important species, 2) nearly extinct species, 3) commercial species, and 4) difficult to regenerate. They have selected 91 species as main target, of which they attempt to collect their seeds or propagate, and then distribute throughout Indonesia. MoF has established an institution called BPTH/Balai Perbenihan Tanahan Hutan (Forest Tree Seed Agency) who is responsible for those activities.

The following presentation was conservation at GWEF (Gunung Walat Educational Forest of IPB) in relation with education program at the university. Main problem faced by GWEF management in conservation is encroaching and conflict with local people. Therefore, in order to get the conservation program working well, emphasis was given to the importance of networking with and benefiting local community, educational program as well as human resource development program. Less attention was given to effort to conserve as many species as possible, which is unlike the other institutions.

The last presentation was given by staff of Department of Forest Resource Conservation, Faculty of Forestry, IPB, who has worked on medicinal plants. In the case of medicinal plants conservation program must go hand in hand with utilization of the plant as traditional medicine. The presenter outlined the strategy to conserve or the action program, also presented the problems encountered. Finally he stressed the need for partnership and capacity building.

The whole Session IV can be wrapped up into following notes:

1. All speakers emphasized the need for human resource development and networking in conservation and breeding program of forest species
2. Due to the magnitude and complexity of problems in conservation all speakers agreed that handling conservation program needs considerable skills in:

- exploring the materials and characterize them
- managing the materials and data generated from it
- prioritizing and decision making

3. All the above conclusions has made the justification of this AUNP project even stronger
4. All speakers has given lots on inputs to the AUNP project for the next program, such as species choices, the participants/partners, priority in actions etc.