Biodiversity in forest restoration

Report on an expert consultation on tree diversity in reforestation in the Asia-Pacific region

Organized by Bioversity International (previously IPGRI) and Chiang Mai University in Hotel Tarin, Chiang Mai, Thailand on 1–3 November 2006

Content

Vice Dean of the faculty of Science of Chiang Mai University, Dr Ruangsri Watanesk, opening the workshop (photo: Markku Larjavaara).

Keynote Presentation by David Lamb – "Reforestation of degraded tropical forest landscapes: some options and some questions"

Extensive and ongoing deforestation during the past fifty years has lead to loss of biodiversity and decline in the goods and services for rural people. The deforestation and the decreasing importance of agricultural sector in industrialising economies leading to people moving to urban areas has left large areas of degraded land available for reforestation. This available land combined with increasing appreciation of ecological services and goods and the rapidly increasing demand of China for forest products has considerable increased the interest in reforestation in tropical Asia.

The three main categories based on the forestation aim are:

- Restoration,
- Rehabilitation
- Establishment of traditional plantations

All three aim at increasing the standing biomass rapidly but restoration fully and rehabilitation partly also includes biodiversity, ecological authenticity or integrity aims. Often the most critical problem in tropical reforestation is about balancing optimally both human livelihood and ecological objectives.

Technical options for forestation include:

- Natural regrowth
- Restoration plantings
- Plantation monocultures of exotics or natives
- Plantation mixtures of two or more species

Natural regrowth is a method to restore degraded forests by protecting them from further disturbances and assuming natural recolonisation from nearby less degraded forests or by performing enrichment plantings of species with high economic or conservation value. The benefit of this method is that existing native vegetation is retained and therefore the existing biodiversity values are conserved. On the other hand, the process can be very slow and heavily dependent on the initial condition of the restored and any surrounding less degraded forests.

Restoration plantings can be divided in the "Framework" and "Maximum diversity" methods. Framework plantings consists mainly of a small number of early successional species that grow fast, attract seed dispersing animals and are preferably fire tolerant and nitrogen fixing, thus facilitating and catalysing the spread of other species from nearby forests. For the maximum diversity method all species naturally occurring at the site are planted at close spacing. A major benefit of this expensive method is that colonisation from surrounding forests is not required.

Monoculture plantations are easy to manage and are hoped to be productive and profitable as the best species can be chosen. However, the variety of goods and services from monocultures is small and ecological and economic risks high. When choosing the species a decision has to be made with typically fast growing exotics and slow growing natives. There is more information on silviculture and seeds are normally easier to obtain for planting common exotics. However, native trees often produce a wider variety of products that are better known and appreciated by local peoples. Therefore in many landscapes both exotics and natives should be planted.

Plantations containing several species can be mixtures of even-aged trees harvested simultaneously or at different times or systems with nurse trees and valuable shade demanding timber or non-timber species planted later beneath. Mixtures are more difficult to manage than monocultures but they increase the survival and production and diversify the products.

Plantation establishment, rehabilitation and restoration are hindered by limited scientific information available. The most important research questions currently are:

- How active are seed dispersers in deforested landscapes? Which species remain? How effective are they? Are their populations increasing or decreasing?
- Should one use seedlings or direct seeding? Using seedlings consumes less seed, offers higher chance of successful establishment, enables mycorrhizal inoculation in nursery but is more expensive. Seeds need to be buried in direct seeding.
- How to design plantation mixtures (production benefits, length of temporary mixtures)? Does greater species richness produce higher yields? How to maintain mixtures?
- How to secure seed sources? Where to collect in the fragmented landscapes? What prescriptions to use? How to safeguard genetic diversity?
- How to make reforestation and attractive option for farmers? Farmers need to have land tenure and food security. In addition, farmers need be aware of the new option, have resources and technical and market knowledge.

- Where to reforest to achieve best functional outcomes (along rivers, eroding slopes, next to forest patches, corridors between patches)? Will many separate decisions by small landowners create the correct landscape mosaic?

Much of the research on forest rehabilitation has been conducted to address needs of large scale industrial plantations. It will be important to assess how the research needs of small farmers and communities differ from those of large scale plantations.

Lee, SL and Anto Rimbawanto climbing a hill that was planted with framework species four months before the photograph was taken (photo: Markku Larjavaara).

Discussions following the keynote presentation

In the discussion following the keynote presentation several participants clarified that native tree species are not always slow growing and that faster growing natives may have huge potential in forest rehabilitation. In addition to providing a narrower array of products, exotics also are less attractive to local fauna and can be invasive. Worst invasives are harmful to local people and penetrate into undisturbed natural forest.

It was decided that the list of six major research areas in the field of forest rehabilitation, as presented in the keynote address, be used to give structure to the discussion.

Seed dispersers

It was noted that generally pollen dispersal is more effective in a fragmented landscape than seed dispersal. Pollen dispersal can be estimated through studies with traditional methods on reproductive biology or studies based on molecular markers, which can vary considerably even with closely related species. However, seed dispersal is essential for tree species to colonise new areas. Species with large seeds naturally dispersed by big

mammals or birds often now have a very limited dispersal as their dispersers have been eliminated.

Direct seeding

The comparison between direct seeding and using seedlings in the keynote presentation raised a supporting discussion. Direct seeding is a viable option in certain conditions even though it almost always leads to a much lower survival rate than planting seedlings. In addition to these two methods also wildlings and coppice sprouting/root suckering need to be considered. Wildlings can be useful for species with recalcitrant seeds and irregularities in fruiting as in the case of dipterocarps. There is little research on sprouting even though is has shown promising results in Thailand. There was no consensus on whether it would be possible and/or worth the effort to develop general guidelines containing information on regeneration methods in rehabilitation among other technical issues. Great spatial variation in floristic, climatic and edaphic conditions would make the development of generalized guidelines quite challenging. On the other hand, many countries have similarities in some types of degraded ecosystems, such as grasslands and secondary forests, and the best practices for rehabilitating them are likely to have many important similarities.

Plantations of several species

An important only partly answered question in designing forestation to address both economic or livelihood and biodiversity aims is about the management of polycultures. In the discipline of forest management the value of spreading risks by mixing species is not understood even though it is evident for investors in other situations e.g. in stock markets that one should not rely on just one stock. For example in Thailand the performance of polycultures has been satisfactory while pests and diseases have sometimes caused major damage in monocultures. Even if the potential of polycultures is understood two factors restrict their use: 1) lack of ecological information on dozens of important species and 2) complicated management of polycultures. It was also mentioned that the minimum number of species to be used in rehabilitation or other forms of forestation ought to be included in government or national policy.

Seed issues

Participants agreed that seed issues are important as the lack of germplasm often critically limits the extent and diversity, within and among species, in forestation. There was a preference expressed for communities to collect seed from nearby forests to make sure the genotypes planted are adapted to local conditions and to strengthen the ownership of the community to the new forest. The importance of well-coordinated and strong national programmes to guide seed flows was discussed. This might also facilitate the transfer of germplasm over long distances which might be necessary in order to make use of genotypes better adapted to altered environmental conditions as a consequence of climate change. Another approach deal with predicted climate change is to still use local material but ensure maximal genetic diversity so as to enable local evolution and adaptation.

How to make reforestation attractive to farmers?
No comments on this research area.

Where to reforest?
No comments on this research area.

Stephen Elliott explaining the benefits of the framework method to Lex Thomson, Enrique Tolentino and Markku Larjavaara (photo: Oudara Souvannavong).

Brainstorming - major issues and challenges in tropical reforestation, especially related to diversity

The participants were asked to identify the most important issues for rehabilitation in their respective countries. The number in brackets following the subtitle refers to the number of comments that participants made in this field of research.

Species characteristics (7)
Basic information on nursery techniques and silviculture for many native tree species normally planted only within their natural distribution often exists but is not easy to access or readily available. This information could be compiled in an internet published database to make it much more accessible. Another group of species are those that have not been properly tested either because of their narrow distribution range, unpromising initial trials or other reasons. Empirical research on reproductive ecology, phenology, germplasm collection, propagation, planting, silviculture, tolerance to disturbances such as fire, uses etc. is urgently needed.

Genetic structure and diversity needed (7)

Information is needed on genetic structure and processes in important tree species. Guidelines need to be developed on desirable levels of genetic diversity for successful rehabilitation to help inform national institutions in their forest restoration work. However, more studies are required for many more species to better address the question of how much genetic diversity is required to avoid inbreeding depression and maximize ecosystem functions.

Mixing species (5)

Research on the optimal number of species or alternatively on the number of functional groups of tree species needs to be conducted for maximizing biodiversity, livelihood and ecosystem function values. It would be useful to study and document situations in which mixing of species is likely to be a more attractive option, for example by demonstrating how risks can be minimized by planting polycultures instead of monocultures. Also, a theoretical model approach was suggested.

Natural regeneration and seed dispersal (4)

Additional scientific knowledge on seed dispersal and natural regeneration would help develop an improved understanding of colonisation processes from neighbouring forests. Species that are poorly dispersed, e.g. because animals naturally dispersing them have been hunted to local extinction, should receive special attention.

Seed sources (3)

Research on locating genetic diversity and conserving of seed sources is urgently needed. People collecting seeds in fragmented landscapes should get practical advice on risks of collecting from small patches comprising just a few individuals of a given species, and on alternative options.

Restoring by using rare species (1)

Through planting critically endangered species as part of forest restoration programs or other forms of forestation, the number of individuals of such threatened species can be immediately increased and the resultant forests can be considered as ex-situ conservation areas for the species.

Keystone species (1)

Identifying non-redundant (irreplaceable in function) or keystone tree species in the ecosystems will be critical for successful restoration.

Community based forest restoration (1)

Forest restoration should be studied at the landscape level and focusing on ensuring genetic diversity and functioning of the ecosystem taking into account species number, carbon sequestration and hydrology.

Stephen Elliott, Suchitra Changtragoon and David Lamb on a plot rehabilitated (using the framework approach) eight years before the photograph was taken (photo: Markku Larjavaara).

Discussion - scope, nature and elements of an Asia-Pacific research initiative to investigate and maximise benefits of diversity in tropical reforestation

Lex Thomson and Markku Larjavaara prepared a list of seven key problems that can be addressed with research. The original list prepared between workshop sessions is shown in *italic* and the comments by participants are shown immediately below:

A. *Lack of vital information on local species (ethnobotany/traditional uses, conservation status, ecology, genetic structure and processes especially mating system, natural regeneration ability, propagation, coppicing, silviculture and utilization/markets) which is required for choosing which species to re-establish, and how to successfully grow them.*

Results of earlier international project are already available. The most significant for Southeast Asia is PROSEA (Plant Resources of South-East Asia), which was a huge effort including leading experts. Based on the dozens of PROSEA-volumes published an internet accessible database including more than 500 agroforestry trees have been developed jointly with ICRAF. However, many potentially valuable species are missing and species information is sometimes not detailed enough for successful management and use in reforestation programmes. Missing information needs to be gathered through research, perhaps using similar approaches and methods to those employed by FORRU (Chiang Mai University). In addition, it would be useful to study genetic diversity as

species and populations having greater diversity will often be more successful in forest restoration programmes.

B. Limited understanding of how much diversity is desirable for ecosystem resilience, functioning and provision of diverse products (species/within species and/or functional group diversity). How to efficiently and effectively combine native species (and exotics) in mixtures (successional status, biological, utilization/rotations, resource use and nutrient cycling, economic, ecological)? Development of model approaches (→ require more studies of different restored forests, both of existing systems and new experiments)? How much genetic diversity is needed for evolution and adaptation, especially given unpredictable climatic changes?

This is a key area research but a very challenging one.

C. Limited understanding of how fragmentation influences species & genetic diversity in remnants (implications on sustainability of forest fragment and for use as a seed source). To what extent does forest restoration (restored patches) narrow genetic base? Role of corridors?

Suchitra Changtragoon informed the meeting of a new, large ADB-funded project that is studying the effect of establishing corridors in fragmented landscape the Western Forest Complex National Park, Thailand. The project recently signed with Department of National Parks will promote wildlife movement within and between the Western Forest Complex and Kaeng Krachan Forest Complex, and between Dong Phayayen and Khao Yai Complex, through improved environmental management. This is part of the Greater Mekong Subregion Biodiversity Conservation Corridors Initiative which also includes Laos, Vietnam and Cambodia. Currently the species selection is going on. The future Bioversity International coordinated project could productively collaborate with this new project.

D. *Lack of identified good seed sources (diverse, well-adapted/local). Need to identify and/or develop local seed sources. Make available simple guidelines/criteria for selecting seed sources.*

The discussion focused on low-input breeding of native tree species. It was suggested that provenance trials should be established for those species that have extensive distributions. Local people could be trained to develop seed stands and undertake simple improvement programmes for species having a small distribution ranges. Another suggestion was that the initiated project should focus on identifying genotypes with broad adaptability and better able to cope with climate change.

E. Lack of information and decision support systems to determine which restoration approach(s) are most suitable for given situation (ecosystem, technical, social and economic dimensions).

No comments from the participants.

F. Understanding and knowledge of keystone (non-redundant) ecological species for particular forest ecosystems. (trees and animals; fruiting phenology & frugivores)

No comments from the participants.

G. Lack of knowledge of how to manage restored forest ecosystems in the longer term (adding value/NTFPs, community ownership/shared resources, access/grazing and harvesting, protection-fire).

An example was given of a very successful community ownership is in Southern Thailand where locals have conserved a mangrove area for tourism.

It was discussed in which ecosystems the future project should focus. Mangroves were suggested but because of already important ongoing international collaboration they were excluded from the discussion. Several edaphically challenging ecosystems such as infertile sandy soils (central Vietnam), rocky soils (northern Vietnam), saline, sodic soils (India and Thailand) and acid sulphate soils (Mekong delta) were suggested but because of their more limited geographical focus it was decided that the further discussion should focus on:

- Grasslands in humid tropics dominated by *Imperata* or other genera (Indonesia, Malaysia, Philippines, Papua New Guinea, Fiji etc.)
- Highly degraded, ex-forest mosaics (comprising grassland, shrub, scattered trees and forest fragments) in humid tropics (Thailand, Indonesia etc).
- Heavily logged-over secondary forests (Malaysia, Indonesia etc.)
- Fragmented hill forests (Thailand, Nepal, Vietnam etc)

Identification of research priorities

In order to further narrow the focus, participants were asked to rate the importance of each of the seven research questions in the identified four ecosystems. Fragmented and degraded both lowland and montane landscapes were ranked as the most important ecosystems. It was considered that grasslands received low scores because of the difficulty of restoring them or because lot of research (especially using *Acacia* monocultures) has already been carried out. All seven research areas were ranked within a relatively narrow range of scores. The lowest (fragmentation) got a low average because fragmentation is not relevant in landscapes fully dominated by grasses. (Table 1)

Table 1. Results of an exercise in which participants were asked to rate the importance of each of the seven research questions in the identified four ecosystems with a scale of 1 (little importance) to 4 (very important). Averages over 3.5 are underlined.

	Information on species (A)	How much diversity (B)	Fragmentation (C)	Seed sources (D)	Support systems (E)	Keystone species (F)	Management of restored systems (G)	**Average**
Grasslands	2.8	2.4	1.3	2.5	2.6	2.0	3.0	**2.4**
Degraded lowland mosaics	3.8	3.8	2.8	3.8	3.1	3.4	3.5	**3.4**
Secondary forests	3.3	3.0	2.5	2.8	2.6	2.9	3.3	**2.9**
Fragmented hill forests	3.8	3.8	3.9	3.6	3.3	3.4	3.5	**3.6**
Average	**3.4**	**3.2**	**2.6**	**3.2**	**2.9**	**2.9**	**3.3**	**3.1**

Because still after the rating exercise there were no clearly outstanding research areas it was suggested that participants would imaginatively consider that they have US$ 100 000 to use for research in forest rehabilitation. Table 2 shows the results.

Table 2. Results of an exercise in which participants were asked to allocate funds in research on forest rehabilitation

Type of research	**Funding**
Information on species (A)	25 %
Fragmentation (C)	22%
Support systems (E)	19%
How much diversity (B)	17%
Seed sources (D)	13%
Keystone species (F)	6%
Management of restored systems (G)	0%

It was noted that despite of relatively even scores in the first exercise (Table 1) participants wanted clearly more funds to be allocated in research on information on species, fragmentation, support systems and the amount of diversity needed.

Components of the proposed research initiative

It was agreed that the first step is to conduct a review or a working paper on forest restoration in Southeast Asia. This should focus on biodiversity and livelihood impacts of earlier forest restoration efforts.

The actual Bioversity coordinated new research initiative should focus in degraded and fragmented forest landscapes (comprising mosaics of grassland, shrubs/thickets and forest fragments) in both lowland and upland sites in Southeast Asia (with possible extension to South and East Asia and the Pacific).

Lex Thomson developed a list of four components to be included in the research initiative that was based on the discussions during the workshop and more particularly the two exercises (Table 1 and 2) conducted to identify the greatest research needs. These elements are shown below, and considerably elaborated following discussion and input from participants.

1. *Collate existing information needed to use local species in forest restoration programmes*
    - Internet based database containing relevant information on hundreds of tree species native to the Asia-Pacific region.
    - Accessible to all but a password needed for inserting and modifying. Passwords are distributed to institutional focal persons.
    - Authors are initially compensated financially for their contribution. Subsequent contributions are encouraged but the database should be financially nearly self-sustained. The name of the author is shown.
    - Information includes when available:
        - taxonomic information and common names
        - morphological characteristics
        - natural and current distribution
        - edaphic requirements
        - seed characteristics (germination rates, storage type conditions and duration, pre-treatment)
        - propagation methods (including direct seeding, seed predation issues, wildlings and vegetative propagation)
        - nursery duration
        - survival, weed suppression and growth (general category)
        - age to reproductive maturity and phenology
        - site amelioration characteristics (N-fixation, soil organic matter build-up)
        - attractiveness to seed dispersing animals
        - fire resistance (age to survive moderate intensity fire)
        - use characteristics (local, economic, cultural, spiritual)
        - conservation status
        - literature

- The database includes criteria, instructions and query-features on choosing best species for rehabilitation.
- Possible research partners include: FORRU, RFD & DNP, FRIM, UPLB, RCBTI, SPC, FSIV, PROSEA, ICRAF, ENSIS/PGFRI.

2. *Undertake and foster research to generate crucial information on species to enable their use in forest rehabilitation*
   - Empirical research conducted to increase the information on potential trees for forest rehabilitation.
   - Harmonized methodologies developed and used in all countries and institutes conducting the research.
   - The research findings will be inserted in the database in element 1.
   - Key areas of research:
     - direct seeding
     - techniques for handling wildlings
     - seed storage physiology (including low technology storage systems)
     - site capturing speed (suppress *Imperata* and other weeds)
     - uses and value to local peoples
   - Most species to be studied provide food or other non-timber products.
   - Stimulate research by forest institutes, NGOs and especially Universities (Masters studies on identified research subjects, with guidelines)

3. *Research on intra- and inter-specific diversity in reforested sites*
   - Studies conducted in sites that were rehabilitated over ten years ago.
   - Main research questions:
     - Are species that were not planted colonizing the sites?
     - What hinders colonisation of some species?
     - Are the planted trees that are reproducing mating with individuals in adjacent natural forests?
     - How genetically diverse are the planted trees?
   - Methods include regeneration surveys – species, size class, density and detailed research on a few selected model species (genetic diversity in regeneration, pollination & mating systems, seed dispersal mechanisms)
   - Possible research sites include:
     - North Queensland, Australia
     - East Kalimantan, Indonesia
     - Nepal
     - Luzon, Philippines
     - Chiang Mai, Thailand
     - Sakaerat, Thailand

4. *Develop and apply rehabilitation models*
    - Simultaneously develop models and guidelines and catalyze forest rehabilitation in selected communities in Southeast Asia.
    - Possible sites include:
        - Quirino, Philippines
        - Chiang Mai, Thailand
        - Khao Yai, Thailand
        - Thaplan, Thailand
        - Western Forest Complex, Thailand
        - Vietnam
        - Research sites of the CIFOR-ICRAF Forest Biodiversity Platform

Funding

The suggested scope and duration for the research project was US 0.5 – 1 Million per year over a 5-year period. Participants suggested numerous potential donors which are listed below under their respective category.

International organizations:

- Asian Development Bank (ADB)
  www.adb.org
- European Union (EU)
  http://ec.europa.eu/research/index_en.cfm
- Global Environment Facility (GEF)
  www.gefweb.org
- International Tropical Timber Organization (ITTO)
  www.itto.or.jp/live/index.jsp
- Secretariat of the Pacific Community (SPC)
  www.spc.int

National governmental organizations:

- AusAID
  www.ausaid.gov.au
- Australian Centre for International Agricultural Research (ACIAR)
  www.aciar.gov.au
- GTZ
  www.gtz.de/en/
- Japan International Cooperation Agency (JICA)
  www.jica.go.jp/english/index.html
- United States Agency for International Development (USAID)
  www.usaid.gov
- In addition, embassies of developed countries in developing countries have funds to support small projects.

Non-governmental organizations:

- Conservation International (CI)
  www.conservation.org/xp/CIWEB
- Plant a tree today (PATT)
  www.plant-a-tree-today.org/home.asp
- Tropenbos
  www.tropenbos.nl
- WWF
  www.panda.org

Other:

- It was mentioned that Toyota and other companies heavily influencing carbon emission might be willing to participate in projects focusing on carbon accumulating forest restoration projects.
- University scholarships and fellowships
- Bill and Melinda Gates Foundation
  www.gatesfoundation.org/default.htm
- Collaborative Partnership on Forests is a FAO hosted portal on funding forestry projects
  www.fao.org/forestry/cpf-sourcebook

Annex 1 - Programme

	Wednesday 1 November	**Thursday 2 November**	**Friday 3 November**
8.30 - 9.00	Welcome, programme, introductions & interests/expectations	Discussion - Scope, nature and elements of an Asia-Pacific research initiative to investigate and maximise benefits of diversity in tropical reforestation	Identification of research priorities
9.00 - 9.30	Opening ceremony - Vice Dean of the faculty of Science, Dr Ruangsri Watanesk		
9.30 - 10.00	Coffee, tea and snacks		
10.00 - 10.30	Keynote Presentation by David Lamb and related discussion – "Reforestation of degraded tropical forest landscapes: some options and some questions"	Coffee, tea and snacks	Coffee, tea and snacks
10.30 - 11.00		Travel to field excursion area of Ban Mae Sa Mai (FORRU demonstration plots)	Identification of research priorities - continued
11.00 - 11.30			
11.30 - 12.00			
12.00 - 12.30			
12.30 - 13.00	Lunch	Lunch	Lunch
13.00 - 13.30		Old plot (framework species method, biodiversity, recovery, etc.)	
13.30 - 14.00	Brainstorming - major issues and challenges in tropical reforestation, especially related to diversity		Identification of research priorities - continued
14.00 - 14.30		New plot (Forest Landscape Restoration, land use issues, etc.)	
14.30 - 15.00			
15.00 - 15.30	Coffee, tea and snacks	Open discussion	Coffee, tea and snacks
15.30 - 16.00	Brainstorming - major researchable constraints related to tropical reforestation, especially related to diversity - continued		Identification of research priorities - continued
16.00 - 16.30		Direct seeding plot	
16.30 - 17.00		Travel to Chiang Mai	
17.00 - 17.30			
17.30 - 18.00			
18.00 - 18.30	Workshop dinner in Khum Khan Tok - restaurant		
18.30 - 19.00		Dinner at Hotel Tarin	Dinner at Hotel Tarin
19.00 - 19.30			
19.30 - 20.00			
20.00 - 20.30			
20.30 - 21.00			

Annex 2 - List of participants

	Name	Position	Institute and Country	E-mail address
Invited participants present in the meeting	Suchitra Changtragoon	Senior Forest Researcher (Forest Geneticist)	The National Park, Wildlife and Plant Conservation Department , Thailand	suchitra (a) mozart.inet.co.th
	David Lamb	Associate Professor	The University of Queensland, Australia	d.lamb (a) uq.edu.au
	Lee, SL	Senior Research Officer	Forest Research Institute Malaysia	leesl (a) frim.gov.my
	Kevin Ng	Researcher	Forest Research Institute Malaysia	Kevin (a) frim.gov.my
	Anto Rimbawanto	Project Leader	Centre for Forest Biotechnology and Tree Improvement, Indonesia	rimba (a) indo.net.id
	Oudara Souvannavong	Senior Forestry Officer	FAO, Italy	oudara.souvannavong (a) fao.org
	Enrique L. Tolentino Jr.	Associate Professor	University of the Philippines Los Baños	eltolentinojr (a) gmail.com
Invited participants unable to attend but interested in the follow-up	Patrick Durst	Senior Forestry Officer	FAO, Thailand	patrick.durst (a) fao.org
	Nghia, NH	Director General	Forest Science Institute of Vietnam	nhnghia (a) netnam.vn
	Jean-Laurent Pfund	Senior Scientist	CIFOR, Indonesia	j.pfund (a) cgiar.org
Organizing team	Stephen Elliott	Senior Scientist	Chiang Mai University, Thailand	stephen_elliott1 (a) yahoo.com
	Markku Larjavaara	Associate Scientist	IPGRI, Malaysia	m.larjavaara (a) cgiar.org
	Lex Thomson	Senior Scientist (Chair of the meeting)	IPGRI, Italy	l.thomson (a) cgiar.org
	Panitnard Tunjai (Dia)	Researcher	Chiang Mai University, Thailand	ptunjai (a) yahoo.com
	Prasit Wangpakapat-tanawong	Lecturer	Chiang Mai University, Thailand	pwangpak (a) hotmail.com