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Plantations on the march

THE way some people talk, tree plantations are the answer to more than a few global problems. They reduce deforestation, restore degraded land, fight climate change, improve local livelihoods, return good profits, create employment and bolster national economies.

Little wonder, then, that tree-planting is proving to be a popular pastime. According to provisional FAO data, about 4.5 million hectares of plantations are being established each year; the global estate now totals more than 180 million hectares.

Not all these plantations are in good shape. Many are called 'paper' plantations not because that is their eventual end-use but because it's the only place they exist; in the field they have died of (a combination of) drought, sabotage, pest attack, fire or some other form of neglect.

In this edition, we take a straight-down-the-line look at plantations: what needs to be done to ensure success? Julian Evans (pp 3–5) has first dig: he outlines seven principles he says will help secure a lasting and valuable plantation resource. One of these, stakeholder participation, has probably been overlooked in many industrial-scale ventures. Plantation forestry, notes Professor Evans, is a long-

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Cover image *Courtesy Aracruz Celulose SA*

... Editorial continued

term business: ignoring the people who live near and have a stake in the land on which the plantation is to be established is a good way to create a long-term problem.

Ross Wylie narrows the focus in his article (pp 6–7). He says that dealing with forest plantation pests and diseases requires an integrated approach that should start in the early stages of plantation design. Dr Wylie introduces, among other things, the notion of 'economic threshold', which is the level of pest damage above which remedial measures must be taken.

Professor Soekotjo and his co-authors (pp 8–9) discuss the essential role of genetic conservation in plantations. While many wild progenitors have been lost to agriculture, forestry is not yet so poorly off: now is the time to combine *ex situ* genetic conservation with tree improvement programs.

Another way of improving plantation productivity is through the establishment of quality assurance indicator plots, as described by Robin Trewin (pp 10–11). Such plots have been used for more than a decade in New Zealand's *Pinus radiata* plantations and have led to major improvements in seedling survival and growth.

Brazil is one of the leaders in successful plantation management in the tropics. Irene Seling and her co-authors outline some of the issues associated with eucalypt plantations there (pp 14–15); a brief profile of one of the country's most successful eucalypt growers, Aracruz Celulose, is also provided. Susan Hummel (p 18) gives some background on another important neotropical plantation species, *Cordia alliodora*.

While the emphasis of this edition is on large-scale plantations, the community element is not ignored. Crescentia Dakubo (pp 16–17) reports on her work in a Ghanaian community, where a participatory-research approach has stimulated villagers to use tree-planting as one avenue of attack against land degradation and social problems.

Plantations as cure

There is no doubt that well-planned and implemented forest plantations can achieve many of the things that people expect of them. The negotiators at the most recent Conference of the Parties to the Framework Convention on Climate Change (COP 6) certainly thought so: 'reforestation' and 'afforestation' are the two land-use practices included in the Clean Development Mechanism to help reduce the concentration of carbon in the atmosphere (natural forests are pointedly excluded). This means that developed countries will be able to claim carbon credits for plantation investments made in developing countries (p 30). How much added investment this will bring into tropical countries is still uncertain.

What is more certain is that if environmentalists get their way, one day all the world's wood will come from plantations. 'Plant up the millions of hectares of degraded land and leave the natural forest alone,' they say.

Maybe that day will come sooner than most people think, but will it be good for the natural tropical forests? Yes, writes Juan Sève in 'Point of view' (p 32). He says that an increasing supply of wood fibre from plantations will ease the pressure on natural forests, an assertion supported by Dr Hummel in her article. Plantations have clear economic advantages over natural forests and are attractive to investors for another reason: natural-forest managers will forever have environmentalists hovering over them, like a Bornean fish eagle watching its prey; plantation managers, though still needing to mind their manners, will have an easier time.

But if natural forests are not to be used for timber production, then for what? Timber production generates real income and real employment. In contrast, many services provided by natural forests, such as biodiversity conservation and carbon storage, are yet to be paid for on a significant scale (and, in the case of the latter, the world community has shown at COP 6 that such payment won't be forthcoming, at least for now). By removing the income-earning potential of natural forests, care must be taken that the forests themselves are not also removed—to be replaced by agriculture or, indeed, by timber plantations.

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How to be successful in plantation development

Abiding by seven principles of good plantation management will help ensure plantation viability

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No decline: a network of long-term productivity plots in this sub-tropical pine plantation in Usutu Forest, Swaziland, shows no significant evidence of yield decline after three complete rotations. The forest owner maintains an active forest research team that underpins this successful forest estate. *Photo: © J Evans*

WE EITHER love or hate forest plantations. To some, they are just efficient and productive fibre factories; to others, they are hopelessly impoverished and impoverishing replacements of rich natural forest.

Both views are misplaced. A plantation can never just be a place to grow pulpwood or any other industrial product. It is too big and too long-lived: unavoidably it will have many other impacts on people, wildlife and the environment. But, equally, a plantation today is rarely a replacement for natural forest. The great bulk of plantations grow on long-denuded or degraded land, waste areas or other impoverished sites; compared with natural forest they are poor in wildlife and some environmental values. Nevertheless, on such sites tree plantations generally improve both non-timber and timber values.

The tension created by the polarised views of plantations needs resolving, and seven principles of successful plantation development will help. These principles are holistic, not sequential, and all must be in place sooner or later; otherwise, sooner or later, the plantation project or program will fail. The principles apply equally to industrial-scale and farm- or village-scale plantings, though sometimes the emphasis differs. This article focuses on the tropics and subtropics, and presents my personal view.

But what is success? We shall define it by saying that a successful plantation is one that meets the objectives of its owners in ways that do not compromise the environment or the livelihoods of others nearby. Aracruz Celulose's highly productive short-rotation pulpwood plantations in Brazil (see page 15 of this edition), Kerala's long-rotation teak stands in India, the many blue gum (*Eucalyptus globulus*) woodlots in the Ethiopian highlands, and the *Casuarina* shelterbelts that help stabilise sand dunes in China are all successful to a greater or lesser extent. Failures are more difficult to cite, because failure is rarely complete (or well reported). Malawi's Viphya Plateau plantations, based on *Pinus patula*, grew well but for a long time didn't have an adequate industrial outlet. Many *Acacia mangium* stands in Southeast Asia are quite well stocked but will not live up to expectations owing to high levels of butt rot and other problems attributable, in part at least, to poor site selection. And across the African Sahel region numerous small plantations have only the odd surviving tree due to poor weed control, termite damage, browsing by sheep, goats and sometimes camels, or simply neglect and lack of interest. So what are the seven ingredients of success?

Know what rights you have: tenure

Because plantation forestry is a long-term business, one must be sure that legal right to the land or the trees grown is secure and in place. No one will invest in tree-planting if there is doubt about who will own the plantation or who can sell or use its produce in years to come.

Establishing legal tenure is often complicated by the array of land ownership traditions or rights such as customary ownership in many Pacific islands or in parts of Africa, where use of land has long been the prerogative of a clan

or tribal chief. Sorting these matters out is a prerequisite for successful plantation development, however big or small.

Stakeholder participation

'Stakeholder participation' is today's jargon for making sure that everyone who has a significant interest in the plantation participates appropriately in decision-making. I can do no better than refer readers to a chapter by Bass in *The forests handbook* (Evans 2001) titled 'Working with stakeholders'. Drawing on experience from across the tropics, Bass discusses the dozen or so stakeholder groups who commonly have an interest in forests, how to identify the main ones, and how to have effective and meaningful relations with them using tools ranging from village meetings through participatory mapping to market research and social impact assessment. All this teaches that, today, any successful plantation project must be rooted, to use a suitable metaphor, in the fertile and often fraught ground of interest groups and interested parties.

... stakeholder participation leads to 'ownership of' or 'buying into' a project conceptually even if not physically, which in years to come repays handsomely.

Let me illustrate the point using a picture from Evans (1992) shown on page 5. Apart from seeing the author as he was nearly 20 years ago (white, bearded, to the right of centre), all the key actors (with the lamentable exception of women) in the 800-hectare Bilate River community forestry project in Ethiopia are present. To the left are local villagers and farmers who will decide what land is included and who will give of their labour; in the middle, between a missionary and myself, are men from the development arm of a local non-government organisation, the Kale Hywet Church; and to the right in the foreground is the local government administrator and behind him (far right) is a forester with certificate-level training who was to oversee the whole project. The photograph was taken in 1982 at the inception stage of the project and illustrates one phase of engaging with stakeholders: we had all just walked over the site together and were about to sit down to discuss what were mainly the villagers' ideas for growing trees (for soil erosion control, firewood and pole supplies), alongside the local administrator's vision for developing the locality. Little did we know that Ethiopia was on the brink of its most severe drought and famine for centuries and that this project would help the survival of several thousand families through food-for-work. This makes the point that stakeholder participation leads to 'ownership of' or 'buying into' a project conceptually even if not physically, which in years to come repays handsomely.

Even if every other principle in this article is complied with, the neglect of basic silviculture would be sheer stupidity.

Know about the land, not just its fertility: land allocation

A critical issue for any plantation project is deciding what land is included; this is a process with which stakeholders should be involved. It will do much to alleviate future disputes if all parties agree up front about boundaries, the land types to be used, what is to be reserved from planting, and so on. Plantations can be very large; it is likely that some land within a potential project may have conservation or archaeological importance or have enjoyed traditional usage or spiritual associations. Such land should normally be excluded from planting; both the process of finding this out and the act of deliberately not planting all land build good relations and demonstrate sensitivity. Like justice, the sensitive allocation of land should not only be done but be seen to be done.

A prerequisite of any plantation project is to work with stakeholders to map out the areas for planting and for exclusion from planting. This is a good time to decide how to augment natural features for biodiversity conservation such as remnant natural forest, watercourses, exposed rocks and crags, and wetland areas. It is also a good time to weigh very carefully the need to plant all the least-fertile land in a project area. In many projects, every last hectare of land is planted for completeness or simply tidiness or to satisfy national program targets, despite the fact that some land will, at best, give only marginal yields. To save resources and to save having to decide later on what do with a poor crop, it is far better to invest the effort in productive stands.

Sound silviculture

In the past, most effort surrounding plantation development has focused on practising sound silviculture: matching species to sites; preparing ground, controlling weeds and taking steps to protect trees; using fertilisers to correct nutrient deficiencies; thinning stands to aid growth of the final crop; and so on. This solid base of good husbandry is no less essential today than in the past. Even if every other principle in this article is complied with, the neglect of basic silviculture would be sheer stupidity.

But I would add a rider: sound silviculture should be viewed as a whole and not as a series of isolated operations. This is particularly true when felling one crop and planting or regenerating the next. Don't neglect replanting by focusing solely on minimising harvesting costs. Plan the entire sequence of operations to minimise damage to soil and maximise the next crop's chance of success.

Selling what you grow: markets

It is self-evident that investment in a plantation intended to yield products must have every expectation of a market existing for that product. Many advocates of plantation development have assumed that a market for the produce will develop while the plantation is growing. This notion is beguiling because the gap between the planting event and harvesting is almost always more than a decade—plenty of time, one might think, for a market to develop. It isn't. I have already cited one example. Another, very different

case, is the Usutu Forest in Swaziland, a 62 000-hectare plantation estate of subtropical pines first created in the 1950s with the intention of growing sawntimber. By the time thinning should have commenced to maximise sawlog out-turn, management had been switched to pulpwood production with no thinning because market conditions had changed. Now for nearly 40 years it has been a successful, vertically integrated plantation forest and kraft mill set-up producing baled pulp for export *(see photo page 3)*.

Putting heads together: stakeholders gather at the start of the Bilate community forestry project in Ethiopia, which led to the formation of 800 hectares of plantation over ten years. Bringing all interested parties together is essential for successful plantations. *Photo: © J Evans*

Never relax: building the research base

Plantation forests, whether large or small, are an investment. Such investment deserves underpinning by research either with one's own dedicated unit or, if small, by participating in a group-support scheme. Research plays three crucial roles:

1) pest and disease surveillance and remedial action: a good example of this is South Africa's successful Tree Pathology Co-operative Programme (TPCP) led by Professor Mike Wingfield at the University of Pretoria;
2) evaluating silvicultural strategies relevant to the project including, crucially, genetic tree improvement. A program of tree improvement, or access to the fruits of one, is the guarantor of maintaining and increasing yields over time; and
3) monitoring what is happening to site and soil. Successful plantation forestry should include knowledge of the effects of one's operations, and this is often a role of research trials. My own long-term assessments over more than 30 years in Swaziland allows the Usutu Forest plantation managers to claim that their actions have caused no yield decline after three rotations and more than 50 years of intensive pine cultivation (Evans 1999; see photo p 3). We know it is true because the data have been collected.

The real commitment: time

This final principle is obvious, but often neglected. Plantation forestry is a long-term business; therefore, the investor must be committed to the long term. This is why many investors in the tropics look carefully at a country's politics. Will the nation be stable enough over the life of the plantation so that the investment will not be jeopardised? No one can ever answer that question with certainty.

The above remarks are self-centred and doubtlessly sensible economics, but there is another dimension to the time commitment. I refer to social, community or rural development planting where the single greatest cause of failure is a lack of commitment over time: initial enthusiasm that fades with time is the death-knell of many a project. All stakeholders must be committed to this dimension of time: plantations are not a quick fix. Part of the success of the Bilate community forestry project was that all stakeholders stuck to working together, although not always harmoniously, over some 15 years. My first visit was in 1982 and my most recent in 1995 with several in between. Commitment over time shows interest in the project and also in the other parties involved. To reiterate: plantations are not a quick fix.

... the single greatest cause of failure is a lack of commitment over time: initial enthusiasm that fades with time is the death-knell of many a project.

Concluding remarks

These principles are not all-encompassing: for example, I have not mentioned profitability and other economic realities or certification issues; nor have I commented much about environmental imperatives. Nevertheless, I believe the seven principles provide a solid foundation: do right by the stakeholders and by the trees planted and everything else will usually slot into place.

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Plague, pestilence and plantations

Integrated pest management should be used more widely in tropical forestry

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PEST OUTBREAKS in tropical forest plantations are almost inevitable at some time during the rotation and can cause major economic losses. In the past, the main response to pests has been to hit them with poisons, but such an approach not only becomes less effective over time as pests build resistance, it also pours large quantities of toxic chemicals into the environment.

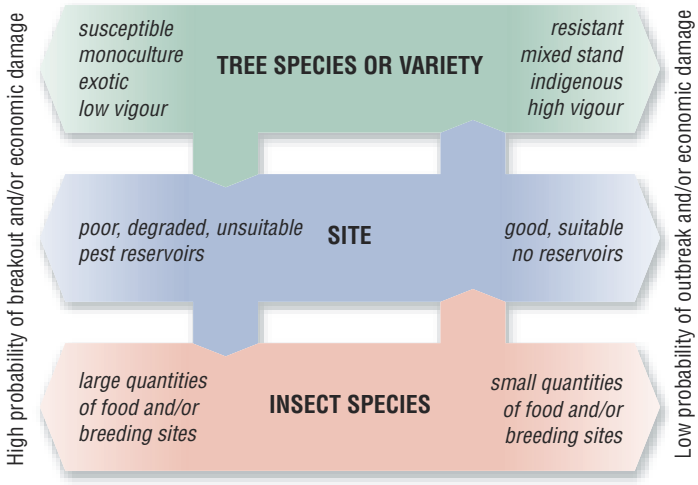
Pest control can be achieved more effectively through integrated pest management (IPM). This can be defined as the use of a combination of control measures—preventative and/or remedial—to contain a pest within operationally acceptable levels of damage with minimal environmental side-effects. The basic philosophy behind it is that control will be more effective, and resistance will be less likely to build up, when a range of measures are deployed against a pest. Crucially, it requires planning and a good understanding of the ecology and biology of both the pests and the plantation crop.

Appropriate strategies

Figure 1 presents the basic factors in insect pest outbreaks in tropical forestry and how these might be addressed in plantation design; *Table 1* summarises the options for pest management. Both clearly show that smart plantation managers will begin implementing their pest management strategies well before they start putting seedlings in the ground. Choosing species and provenances that suit the site (and will therefore grow vigorously) and demonstrate resistance to potential pests is clearly important. However, resistance can be overcome if selection pressure is high enough and planting a mixture of resistant varieties—if more than one is available—is probably the best strategy. Multi-species plantations or even single-species plantations with a 'mosaic' of tree ages are also less likely than even-aged monocultures to experience catastrophic pest infestations.

Pesky

Figure 1: Summary of factors which may interact to create insect pest outbreaks in tropical forestry, and strategies for reducing risk *(from Speight 1997)*



The merit of planting exotic as opposed to indigenous tree species is still the subject of debate; it depends on a range of factors, not just indigenous or exotic status. Exotics sometimes experience an initial period after introduction where there are few pest problems, but indigenous pest organisms may gradually adapt to these new hosts (Wylie 1992). Indigenous plantations also experience damaging pest outbreaks despite the presence of natural enemies. Intelligence on possible pest threats is essential.

Individual IPM programs won't necessarily include all the options shown in *Table 1*; plantation managers need to tailor their programs depending on circumstances.

Challenges in implementing IPM in forestry

Defining economic damage

In their IPM programs, managers must establish what is called the 'economic threshold': this takes into account the revenue losses resulting from pest damage and the costs of treatment to prevent unacceptable damage. Below the economic threshold, the presence of the pest is tolerated. Only when damage rises (or is predicted to rise) above the threshold is action taken *(Figure 2)*.

Determining the threshold value is made particularly difficult in a long-lived perennial crop like a tree plantation, because economic and biological forecasts sometimes must be made over decades. For example, an Indonesia-based pulp and paper company constructed a mill in the 1980s and simultaneously established plantations of eucalypts, the first of which was scheduled for harvest eight years later when the existing natural resource would be exhausted. The plantations suffered a severe attack from sap-sucking mosquito bugs (*Helopeltis* spp.), causing sufficient damage to threaten harvesting schedules and thus pulp supply to the mill. In this situation, the insect damage assumed greater economic importance than could be attributed directly to growth losses because the mill might have closed if sufficient fibre could not have been supplied. The economic threshold

Stage-managed

Table 1: Components of a generalised IPM system. Stages A and B are entirely preventative, Stage C involves monitoring and prediction, and Stage D covers control strategies should prevention fail or monitoring reveal high risk *(from Speight et al. 1999)*

Stage	Options			
A	Site choice: avoid low tree vigour; consider history and previous cultivation	Tree species or genotype choice: consider end-use and economics	Location choice: consider proximity to older stands and natural vegetation	Silvicultural choice: consider mixed vs monoculture, shade resistance, enrichment
B	Inventory major pests and diseases in locality; consider history of problems	Research biology and ecology of major pest and disease species, especially host plant relationships	Inventory pests' major natural enemies in locality	
C	Determine potential impact of major pests on crops; set economic thresholds	Monitor pest levels during vulnerable growth period; relate to economic thresholds		
D	Ecological control: sanitation thinning; nursery treatment; establishment	Biological control: parasitoids; predators; pathogens	Chemical control: insecticides; growth regulators; pheromones	

was therefore set lower than would have been appropriate on growth losses alone.

Monitoring, training and cost

IPM relies heavily on monitoring to identify areas where pest populations are high and when economic thresholds are likely to be exceeded (Clarke 1995). In contrast to intensive agriculture, however, such monitoring may be impractical or at least inaccurate in large and inaccessible forest areas. Advice from trained forest protection specialists is essential at all stages of the program, but this may not be available in all developing tropical countries and will be a particular problem for small-scale forest operations. IPM is more complex than just spraying with a chemical pesticide, and it can be expensive when detailed monitoring is required. This is obviously a constraint in many tropical forestry operations where profit margins may be low.

IPM in practice

Table 2 provides examples of pest infestations and the IPM tactics that have been deployed successfully in response.

Case study: sirex wood wasp

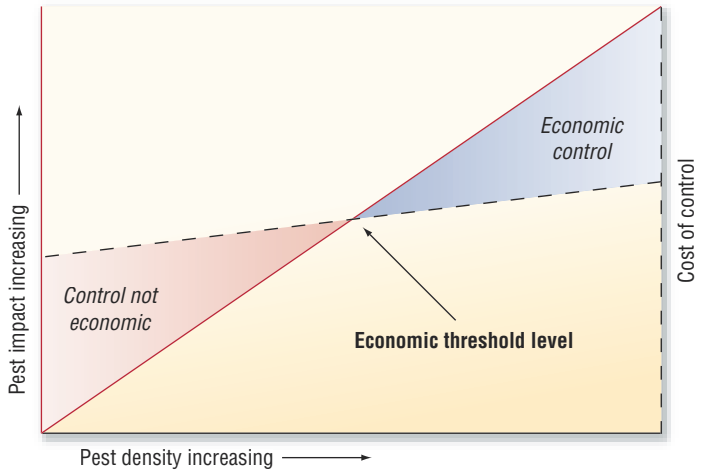
The sirex wasp, *Sirex noctilio*, was accidentally introduced to Australia from southern Europe almost 50 years ago and is a serious pest of *Pinus* plantations. The most destructive outbreak occurred between 1987 and 1989 in the states of South Australia and Victoria; more than 5 million *P. radiata* trees with a royalty value of A$10–12 million were killed (Haugen et al. 1990).

As described by Elliott et al. (1998), the IPM strategy employed against sirex combines detailed monitoring and detection methods, silvicultural treatments and biological control. Detection relies on forest surveillance by aerial and ground inspections and a trap tree plot system that uses herbicide-injected trees, arranged in plots on a fixed grid depending on infestation level, to attract and concentrate *Sirex* populations. The objective is to detect the wasp in a given locality before annual *Sirex*-induced tree mortality reaches infestation levels of 0.1 percent (1–2 trees per hectare in an unthinned stand).

Silvicultural treatment of *P. radiata* plantations by thinning to maintain or improve tree vigour is a key factor in preventing *Sirex* establishment or keeping damage within acceptable levels. Control of *Sirex* populations established in a plantation is achieved by biological means using the parasitic

Drawing the line

Figure 2: The concept of economic threshold in insect pest management *(from Speight et al. 1999)*



Fighting back

Table 2: Examples of pest management problems and the IPM tactics employed to combat them

Example	IPM tactics
Sirex noctilio wood wasp in Australia and South America (see case study)	Detailed monitoring and detection (aerial and ground survey, trap trees), thinning to improve stand vigour, biological control
Fivespined bark beetle *Ips grandicollis* in Queensland, Australia	Quarantine and pheromone monitoring of zone border, salvage of damaged trees, destruction of logging slash, biological control
Root disease caused by *Rhizina undulata* in South Africa	Chemical insecticides, delayed planting, sanitation felling and removal
Dieback induced by *Sphaeropsis sapinea* in South Africa	Use of resistant/tolerant tree species, sanitation felling and removal
Sal heartwood borer *Hoplocerambyx spinicornis* in India	Regulating timing of felling, removal of logging debris, monitoring to detect infested trees, sanitation felling and removal, trap trees

nematode *Beddingia siricidicola* (by artificially inoculating nematode cultures into *Sirex*-attacked trees whence they sterilise, and are carried by, the emerging *Sirex* adults), and parasitoid wasps. Regular evaluation of the dispersal and effectiveness of these biocontrol agents is an essential component of the strategy.

In South America, *S. noctilio* was first detected in Uruguay in 1980, in Argentina in 1985 and in Brazil in 1988. Current annual losses in Brazil are estimated at US$5 million (Iede et al. 1998). Brazil has implemented most of the components of the Australian IPM strategy described above and the other countries are working towards this.

Concluding comment

IPM offers an effective and environmentally acceptable means of pest management. For forestry, the key IPM tactic is that of prevention. This requires planning, expertise and information-gathering on the pest 'enemy', but such efforts may make the difference between an economically viable plantation enterprise and one plagued by pest problems.

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Genetic conservation and plantations

Plantation forestry owes its success to biodiversity and must play a role in conserving it

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IN 1998, ITTO took an important step in the conservation of tropical tree species by funding ITTO project PD 16/96 REV. 4 (F) '*Ex situ* conservation of *Shorea leprosula* and *Lophopetalum multinervium*'. Conducted by the Faculty of Forestry at Gadjah Mada University in Yogyakarta in cooperation with the Government of Indonesia, the state-owned forest companies (PT Inhutani I–V) and Oregon State University in the United States, this project aims to: 1) avert declines in the genetic variability of indigenous timber tree species *Shorea leprosula* (red meranti) and *Lophopetalum multinervium* (perupuk) and 2) plan and implement *ex situ* conservation plantations of these two endangered species for use in future genetic improvement programs. Both species are of major economic importance; *S. leprosula*, in particular, is the most important commercial tropical species traded in the international market.

A third activity of the project was to plan, organise and sponsor a major international conference on *in situ* and *ex situ* conservation of commercial tropical trees. This conference was duly held last June in Yogyakarta on the campus of Gadjah Mada University; it was attended by over 120 people from ten nations and featured more than 50 invited and voluntary papers and also a number of poster presentations. This article summarises the results of the conference and emphasises the relationships between genetic resource conservation, plantation forestry and sustainable forest management.

High aspirations: a seed-collector employed under ITTO PROJECT PD 16/96 REV. 4 (F) harvests the fruits of a fine specimen of *Lophopetalum multinervium* (perupuk) in Kalimantan, Indonesia. *Photo: Gadjah Mada University*

Why genetic conservation?

Ultimately, the sustainability of a given ecosystem depends upon the maintenance of diverse and healthy gene pools of the organisms that constitute it. Since dominant forest tree species are often the 'keystone species' for maintaining biodiversity in tropical forests, the conservation and maintenance of their genetic diversity assumes paramount importance for conservationists and forest managers alike.

Also important is the need to preserve wild-type gene pools for domestication in plantations; having a diverse gene pool from which to select will help in the search for varieties that are resistant to pathogens, pests and environmental pollutants and have high growth rates and good wood qualities. For example, the huge diversity within and between eucalypt species has greatly assisted the establishment of highly productive plantations in Brazil (see article pp 14–15).

Lessons can be learnt from the agricultural experience: the genetic identities of almost all modern domesticated crop species are now quite different from those of their wild progenitors. Indeed, in many cases, those ancestral species no longer exist, severely limiting the improvements that can be made. The importance of maintaining a broad and viable genetic base, therefore, is an accepted principle among forest scientists and managers alike. But, of course, the *real* challenge is to successfully put that principle into practice so that there is an appropriate balance between conservation and sustai4nable production.

Ex situ *vs* in situ conservation

Ex situ conservation is the conservation outside its natural habitat of a species' genetic diversity; it can certainly play an important role in guarding against biodiversity loss. Botanical gardens, arboreta, seed orchards and banks, clonal banks, common gardens, provenance tests, progeny tests and, more recently, DNA libraries are all examples of *ex situ* genetic conservation. Even some commercial forest plantations—

certainly those established with seedlings derived from a relatively broad genetic base—represent a type of *ex situ* conservation, one that is especially important for species with rare or endangered natural populations.

However, all but the most insular of breeders will acknowledge that such *ex situ* practices, while important, are only 'back-ups' or vehicles for research convenience: *in situ* conservation—conservation of a species and its genetic diversity within natural reserves—is needed to successfully conserve wild gene pools of tree species on a long-term basis. Importantly, only natural conservation areas of adequate size and appropriate distribution and management provide the needed elements of intra- and inter-specific competition and natural selection that drive evolutionary processes (which in turn begets diversity). Moreover, *in situ* conservation areas serve as both a reference point and source of materials in the design and implementation of reintroductions and ecological restoration projects.

Speakers at the Yogyakarta conference observed that *in situ* and *ex situ* conservation strategies for a species should be complementary. One or both may be necessary to conserve a particular species or population.

Combining improvement and conservation

Genetic improvement and conservation should also be complementary. *In situ* conservation, if properly planned, can contribute significantly to an *ex situ* tree improvement program by providing a sustainable source of genetic material, while the tree improvement program can provide the motivation and resources for successful *in situ* conservation. If a conservation reserve system is to adequately represent the genetic diversity of an ecosystem, information on gene frequencies and population size is critical. The proper design and maintenance of *ex situ* plantings are necessary to maximise genetic recombination while minimising outside contamination. Maintaining separate breeding populations based on specific traits of interest is one effective way to maintain diversity and minimise the loss of low-frequency alleles (genes for particular traits).

Breeding and supportive genetic conservation activities are expensive; cooperative approaches should be encouraged to reduce costs, save time and maximise efficiency. The results of several existing programs, presented at the conference, indicate both the scale of threat to the genetic resources of several species and a promising degree of success in alleviating those threats. Results also show that when properly planned and conducted, combined genetic conservation and improvement programs can have favourable cost:benefit ratios and can serve to improve the public's perception of plantation forestry. Because of the high costs of such programs, the constraints imposed by land tenure systems, and the economic status of many of the potential producers of genetic materials, conference participants agreed that some level of local and national (and international) government support for conservation activities is appropriate and necessary. This is especially true for those forest species and systems that are not currently utilised by forest industries but are nonetheless of great value to local communities and the nation.

Various biotechnological tools for improving tree-breeding and for understanding the phylogeny and ecology of populations and species were discussed at the conference. Participants noted that some powerful molecular techniques could be useful in conservation strategies by elucidating genetic diversity, population structure, gene flows and mating systems with reasonable accuracy. Research on such technologies needs to be further strengthened.

Representatives from several ASEAN nations summarised genetic conservation activities in their countries. It was gratifying to learn that there is not only an awareness of the need for such efforts in the region, but also quite a bit of organised activity to establish both *in situ* and *ex situ* conservation areas for rare and endangered indigenous species as well as for species that are critical for sustainable commercial plantation forestry.

The role of local people

At the Yogyakarta conference, a vision for genetic conservation was presented and discussed, one where the forest is understood not only as an ecosystem—a biophysical entity—but also as a 'soft system' comprising the interactions among all levels of society and the forest landscape. This underlines the importance of involving local communities, farmers and small companies in producing and conserving genetic materials. Besides maintaining the genetic materials on local farms, communities could grow trees in smallholdings to complement and extend the resources of forest industries.

Many farmers are interested in tree-planting, but while they have indigenous knowledge they often lack technical skills and tools. Increasing awareness of the importance of using high-quality planting materials and providing access to those materials and technical assistance is essential for capacity-building in rural communities. Such a program would improve the success of genetic conservation efforts, in general and especially for species of higher value.

In situ *conservation, if properly planned, can contribute significantly to an* ex situ *tree improvement program by providing a sustainable source of genetic material, while the tree improvement program can provide the motivation and resources for successful* in situ *conservation.*

A new centre?

We hope that the information shared and contacts made at the Yogyakarta conference will lead to even more regional-level cooperation on the genetic conservation of tropical forest trees. In that context, conservation projects such as the ITTO-sponsored effort to develop effective strategies and systems for the *ex situ* conservation of *Shorea leprosula* and *Lophopetalum multinervium* in Indonesia will play an important role in teaching and demonstration, as well as in conservation. With continuing concern, interest and support from government, industry and the international forestry community, this work could form the nucleus of a regional centre for the conservation of tropical tree genetic resources, which was proposed at the conference. Such a centre could make valuable contributions to the basic knowledge of species' biology and to the sustainability of both natural and planted forests in the tropics.

Rest assured with quality assurance

Quality assurance indicator plots are an inexpensive, reliable way of gauging the quality of plantation establishment and management

by Robin Trewin

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The good, the bad and the dead: the only difference in the radiata pine out-planting system used in the quality assurance plot on the right and the 'standard' practice on the left was in the care taken during the transfer of trees from the nursery to the field. The dramatically better survival and growth in the QA plot led to significant changes in planting practices in New Zealand. *Photo: R. Trewin*

UNLIKE most manufacturing processes, mistakes made during the establishment of tree plantations are not always identified easily and can have a long-term negative effect on the performance of the plantation—with major financial implications. Therefore, a cost-effective system for revealing weaknesses and raising standards would be of considerable value.

Several companies in New Zealand and Australia use quality assurance (QA) indicator plots for this purpose. These are small 'control' plots established in the main plantation using the prescribed out-planting prescription, stock selection, handling and planting. They act as a gauge of efficiency for side-by-side growth comparison with the 'standard' production practices employed throughout the plantation. The regular monitoring of QA plots helps reveal deficiencies in establishment prescriptions and the quality of their implementation in production plantings. They also provide a reliable basis for sampling the quality of plantations through to maturity.

Stocking down, but problems persist

The distortion of root systems in small containers and by poorly trained and supervised planters continues to cause stability problems (leading to wind-damage toppling) in fast-growing plantations. However, research and practical experience over many years in New Zealand have led to considerable improvements in seedling survival rates for *Pinus radiata* (radiata pine). This has allowed substantial reductions in the initial stocking from over 2 000 stems per hectare a few decades ago to 1 000 stems, with 2.5 m x 4 m being a standard spacing. On good land a stocking of 833 stems is common. One large company was so confident of its establishment procedures that it reduced initial stocking to 550 stems per hectare (it recently reverted to 833 stems because the wider spacing encouraged the growth of large branches).

How have these reductions been achieved? The use of improved tree breeds has helped, as has the careful integration of improved nursery and out-planting methods. Because most forest managers resist change, scientists used indicator plots in production plantings to demonstrate the growth improvements possible in such an integrated system. The benefits of the system were clearly demonstrated on a poor site: the survival rate for indicator plots was 98% against only 49% in the adjacent production planting *(see photo)*. Seeing is believing: when presented with this kind of evidence, forest managers quickly adopted the new system. One forester using QA plots reported:

> *"When the actual operational establishment of radiata pine is compared side-by-side with potential (ideal) implementation of our prescription techniques for lifting, dispatch, and planting, it is found that first-year growth of seedlings established on an operational basis falls short of potential. Loss of potential growth amounts to 2.8 mm in diameter (21% of potential), 15 cm in height (16% of potential) and 44% of potential bulk growth. Survival is also down to 92% of potential survivals."*

Improvements in the culling and handling of stocks in the planting season following this assessment raised survival from 92% to 99%, with associated improvements in initial growth.

Survival and growth problems are almost inevitable; in many parts of the world the land available for forestry is

degraded or drought-prone. Even where soils and climate are favourable, pests, disease, high winds and other natural disasters can have devastating effects on young stands. The responsibility for failure generally falls on forest managers, who must be able to show that their establishment prescriptions and implementation were sound. Government agencies or investors faced with failed plantations and financial loss will naturally question competence and, if dissatisfied, may fire the unfortunate manager. By establishing QA plots in all new plantings and monitoring health and growth at regular intervals, forest managers soon become aware of problems and can rectify these in future plantings.

Establishment

The forest manager responsible for establishment should visit supply nurseries regularly to monitor the growth of tree stock. Root development, especially in containers, must be examined carefully by washing away all media to reveal form. Poor root development, common in small containers, can adversely affect field growth and reduce stem anchorage in high winds. At planting, a representative sample of three plants (small, medium and large) should be photographed and filed with comments on quality for future reference in stand records. At regular intervals throughout the planting season the forest manager should visit the nursery and supervise the packaging and dispatch of trees for QA plot plantings. With the nurseryman he should visit the planting site to check that stock has arrived in good order and to supervise the planting of QA plots.

The nurseryman's involvement in the monitoring of planting operations and subsequent visual checks of growth quality will help with the development and integration of the 'nursery-to-field' outplanting system. In New Zealand, plants are packed directly into the box from which they are planted to reduce handling damage.

Planting the QA plots

QA plots must represent, as near as practicable, exact nursery and field prescriptions. If stock quality and/or site preparation are not to specification then this must be noted in stand records and, where possible, supported by photographic evidence. For reliable growth comparisons with production plantings, alternate rows of recently production-planted trees should be carefully removed (these plants can be immediately replanted elsewhere) and replaced with fresh QA stock. These should not be planted in the holes created by the removal or production seedlings but in freshly cultivated spots with root positioning and firming-in to exact specifications. The plots should be clearly marked with poles for ease of location, with positions shown on compartment plans. Production field staff should not be notified of when or where the QA plots will be established so that the quality of their work will not be influenced.

The frequency of the plots will depend on the size and uniformity of planting sites; plots should be established to cover large variations such as soil and elevation. In large-scale plantings (over 100 hectares), one 100-tree plot (10 trees in 10 rows) per 100 hectares is recommended. In plantings of 100 hectares or less, two 50-tree plots (10 x 5 rows) should suffice. An additional five plants should be planted at opposite corners of each QA plot between rows for root growth/form excavation assessments; these will also help identify QA plots should marker pegs be removed.

Monitoring

The health of seedlings and the form of roots in both the QA plots and surrounding production plantings should be visually assessed every three months in the year of planting and six-monthly thereafter—a survey of a 100-tree plot should take no longer than about 30 minutes. A simple assessment sheet with ten columns of ten spaces is used to score 10-tree QA plot lines on a scale of 1 to 5, where 1 = very healthy vigorous plant, 2 = healthy plant, 3 = slightly unhealthy, 4 = very unhealthy and unlikely to survive, and 5 = dead. The assessor should have photos showing 'textbook' examples of seedlings in each of the five categories. The comparative success of the production planting system can be assessed in the same way on adjacent production rows: the lower the score the better the survival and growth. A large disparity in scores or root form between QA plots and the adjacent production plantings indicates a lack of quality control that the forest manager must address.

The responsibility for failure generally falls on forest managers ... By establishing plots in all new plantings ... forest managers soon become aware of problems and can rectify these in future plantings.

Who monitors?

It should be the sole responsibility of the forest manager to check QA plots and to appoint a deputy if he is away. In New Zealand it has been observed that the involvement of senior staff in the establishment of QA plots has a very positive effect on work quality. Scheduled visits for QA plot assessment provide managers with regular opportunities for the detection of growth defects that would otherwise go undetected.

In pursuit of precision

It may be a while before the new art of precision forestry is practised widely, but eventually it could help save forestry from self-destruction

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BUDDHIST monks in Japan are said to manage the trees around their temples on a cutting cycle of a thousand years. They have growth records for individual trees stretching back centuries.

Could all forestry be like that? Sustainable forest management must surely be within reach when we know what is happening in the forest at such a fine scale.

Mostly, though, forestry is not very precise, or accurate: foresters tend to rely on rules-of-thumb in the preparation and implementation of management plans. In the last few decades, too, loggers have mostly used the very blunt instrument of the bulldozer to go about their business.

Monks don't have a particularly high demand for timber, nor for profit, and few of us can live like monks. In the harsher world of commerce, timber must compete in the market with a whole lot of alternatives. To make a profit, companies extract the timber as quickly and as cheaply as possible; in effect, they reduce the precision of forest management in order to increase the efficiency with which they make money. But perhaps the coming of precision forestry will change all that.

Defining precision forestry

Perversely, a precise definition of this new approach is elusive, although several alternatives were put forward at the 'First international conference on precision forestry' convened recently in Seattle, USA. In one speaker's mind, precision forestry was the linking of forest management to precise locations in the field using advanced methods of information technology. Another defined it as 'the use of increasingly high-resolution data to make forest management decisions at an increasingly fine scale'. Others spoke of linking information about the forest stand and individual trees with the chain of timber supply. Precision forestry is new because many of the data collection, storage and communication technologies are new, at least to forestry.

... precision forestry will need to be more than a few new technologies. Its real promise lies in its ability to improve the forestry process, not only helping to collect information but to use it for better and more transparent decision-making.

The technologies

Indeed, a casual observer would be forgiven for thinking that precision forestry was the exclusive domain of techno-nerds. Certainly, it is awash with acronyms—LIDAR, GIS, GPS, CT, and so on. This is what some of them mean:

GIS: a basic prerequisite for precision forestry is the ability to store and analyse the vast quantities of data that can now be collected. Geographic information systems have been in widespread use in forestry agencies for a decade or more and are now a reasonably mature technology. They are computer-based applications for the acceptance, storage, analysis, retrieval and display of spatial data; that is, data which are somehow described in terms of their geographic location. Without GIS, many precision forestry technologies would be useless because there would be no way of handling the data they collect.

GPS: global positioning systems have also been around for a while and are used routinely in aircraft and ship navigation and increasingly in car navigation systems. They could be used in forestry. For example, Professor Gero Becker from Germany outlined an 'ideal' harvesting system on privately owned land in which harvesters are equipped with a GPS, digital maps of harvesting areas and other technologies. The map contains information such as tree characteristics, property boundaries, and the location of features such as swamps, drainage lines and buffer zones. The operator sees this information on his display inside the cabin; the GPS gives the harvester's location, so the ownership of each tree can be recorded on the harvester's computer even when property boundaries are not clearly marked in the field. During harvesting, the harvester automatically takes length and diameter measurements of the stem every 10 cm; these stem profiles are matched by the onboard computer with the buyer's demand tables so that cross-cutting can be executed according to the buyer's exact needs. Each log is then 'tagged' with this information using barcodes or microchips while simultaneously the information is relayed to the mill and the owner via wireless communication. Thus, even before the log is taken physically out of the forest, buyers—and owners—have access to a wide range of information on the product. Other links in the supply chain—forwarders, processors, and so on—would use similar tools in their operations.

One of the drawbacks of GPS is that it is not particularly accurate under a heavy canopy (such as in most forests). Joel Gillet spoke of a system that combines a GPS with an inertial navigation system containing gyros and accelerometers that track the course of the vehicle or person carrying the device in 3-dimensional space; when conditions allow, the device 'checks' its position using the GPS. The accuracy of this sort of system is increasing but the cost is probably prohibitive at this stage.

LIDAR: LIDAR (**li**ght **d**etection **a**nd **r**anging) is a relatively new addition to the suite of remote sensing technologies now available. It works by emitting an infrared laser light pulse and recording the time it takes for the pulse to strike a target and return to a receiver. From this time it is possible to calculate the distance to the object, because we know that the light pulse travels at 3×10^8 m per second and distance = velocity divided by time. By sending out thousands of pulses a second, aircraft-mounted LIDAR can quickly gather large quantities of data about the terrain over which it passes.

This technology has a number of potential applications in forestry. Mounted onto aircraft—fixed wing or helicopter—it can be used to survey forests, producing digital terrain models and estimates of tree and stand height, stand density,

and tree and stand volume. One paper presented at the conference investigated the use of a LIDAR-generated digital terrain model for road design; it can provide fast and accurate estimates of earthworks and may eliminate or at least reduce the need for ground surveys. LIDAR can also be used for such diverse purposes as tree height measurement and logging planning.

CT scanners: computerised tomography scanners are rather different tools of precision forestry. In widespread use in medicine, these instruments use x-rays to produce high-resolution density maps of internal structures. When applied to logs they can distinguish grain patterns and knots and other defects; such information could help saw and veneer mills to optimise both the recovery of timber and its aesthetic qualities. Tim Rayner of InVision Technologies suggested that CT scanners could be used to grade logs prior to sale; making the information available to prospective buyers, perhaps via the internet, would be a powerful marketing tool.

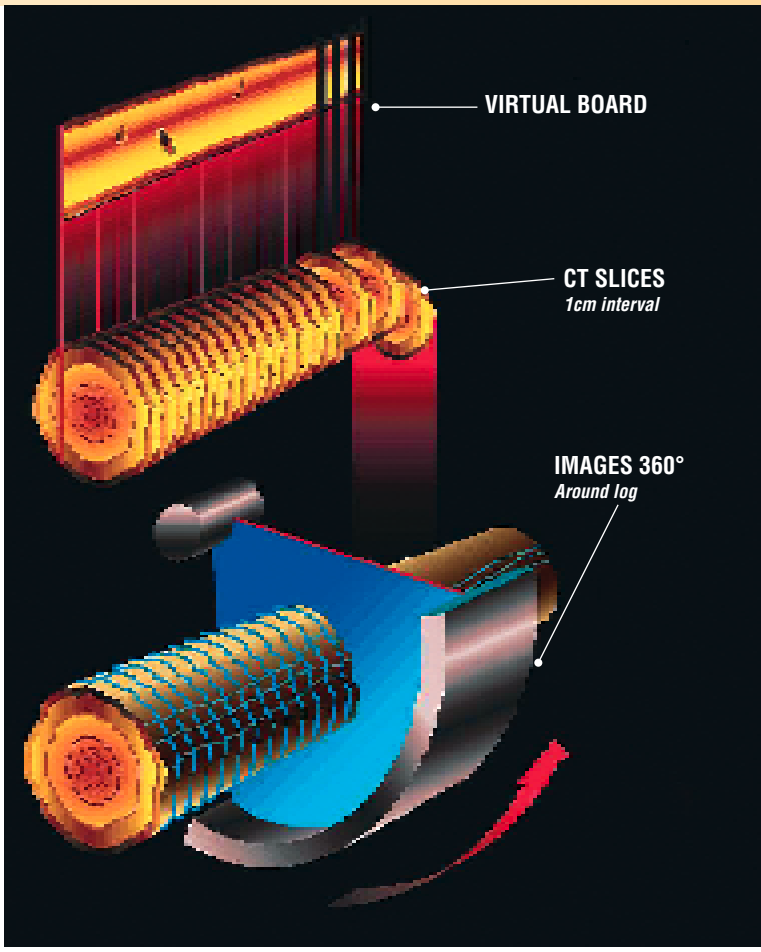
Microchips: How can a log be cut, transported and milled without losing its information? One idea is to tag it with a microchip that is attached to the log at felling; information can be added as it progresses along the production line. The same idea could be applied to living trees: a microchip attached to a tree could collect information about that tree's growth over time and then transmit it periodically—providing it has a source of power, such as a long-life battery—to a remote receiver. Fanciful? Maybe, but the technology is almost there.

More than the sum of parts: for it to be something special, precision forestry will need to be more than a few new technologies. Its real promise lies in its ability to improve the forestry process, not only helping to collect information but to use it for better and more transparent decision-making.

Applying it to the tropics

What role might precision forestry play in the tropics? In natural forests, a great deal more precision could be brought to bear on management with limited use of the new technologies. For example, regulations in some tropical countries require that each tree in a logging compartment be measured and mapped before logging (a level of precision unknown in many temperate logging operations). GIS and, perhaps, GPS systems could be—and, in some cases, are being—used to help plan reduced impact logging operations, increasing the accuracy of such information and its availability.

Precision forestry at the high-tech end of the scale will only become feasible in natural forests when the value of the forest is sufficient to warrant the investment. It might work, for example, if only timber of the highest value is to be extracted: precision forestry technologies could be used to identify individual trees of particular species with remote sensing, to monitor their growth and other ecological factors, to plan minimal impact logging activities, and to market the timber. But currently such a regime is far-fetched.



Virtual milling: a CT scanner can be used to generate longitudinal 'virtual' boards, which can be used, in turn, to maximise timber recovery and to aid marketing. *Image courtesy Tim Rayner, Invision Technologies, Inc.*

Perhaps the most likely near-term role for precision forestry is in plantations. Trees grow quickly in the tropics: applying precision forestry would help bring about the data management and quality control necessary for tropical plantations to compete with—and to out-compete—the generally better organised plantations in the temperate regions. The key question is cost, although this will come down as the technologies mature and become more widely adopted.

The future

The Seattle conference was, according to its organisers, the first of its kind. It was a low-key event, attended by about 100 researchers and technology brokers but very few timber merchants, policymakers or forest owners and almost no one from the tropics. Precision forestry is an idea ahead of its time: even in agriculture, where agribusiness has been hawking the technologies for years, only 5% of farmers in the United States have adopted them. This is partly because of the cost versus the benefit: none of these technologies comes cheap, and the pay-off, if there is one, may not be immediately recognisable either on the balance sheet or on the ground.

But the forestry sector has suffered in the past for its lack of innovation and adaptability. It has been caught in a paralysing dilemma between pleasing accountants (and shareholders) on one hand and the environmental movement on the other. Forest management at an increasingly fine scale should bring benefits to the environment. At the same time, better information about the resource will aid operational efficiency and may eventually increase profits. The technologists still have some issues to work through before the bean-counters and greenies will jump on board. The challenge for tropical foresters is to be in the driver's seat when they do.

The Aussies in Brazil

Eucalypts dominate Brazil's plantations. What are the issues?

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BRAZIL has a highly developed forest plantation estate. About 65% of the country's total roundwood production of 199 million m³ comes from approximately 7 million hectares of plantations, of which 5 million hectares are classified as industrial. These plantations are dominated, although not monopolised, by species in the Australian genus *Eucalyptus*.

Estimates of the area planted to eucalypts range from 2.96 million hectares (FAO 2000) to 3.6 million hectares (Lima et al. 1999). Similar variations can be observed in estimates of plantation yields, which range from 15–26 m³/hectare/year (FAO 2000) to 46 m³/hectare/year (Associação Brasileira Técnica de Celulose e Papel 1999). According to Nelson Barbosa, president of the Brazilian Silviculture Society, the average productivity of eucalypt plantations is about 34 m³/hectare/year.

Existing eucalypt plantations are therefore producing, on average, around 102 million m³ of stem volume per year (ie 3 million hectares of plantation growing at 34 m³/hectare/year). Expected future advances in genetics, cloning, fertilisation and management and an expanding plantation estates suggest that this volume will even increase; this is reinforced by field evidence of growth rates as high as 100 m³/hectare/year in situations where growing conditions are excellent and high-quality clonal stock is used (Barbosa personal communication).

Utilisation of Eucalyptus

Most eucalyptus wood produced in Brazil is used for pulp and charcoal production; only about 200 000 m³ of sawnwood are produced annually. But there is evidence that the sawnwood market will grow in the future. In 2000, one of the biggest wood companies working with *Eucalyptus*, Aracruz Celulose, expanded its sawmill sector to an annual capacity of 100 000 m³ *(see box next page)*. One of the main reasons for such diversification is to make use of surplus timber and to diversify economic activities. This is aided by the fact that the technical problems of sawing young eucalypts, such as splitting and warping, can be handled much better today through genetic improvement and new milling and drying technologies.

Coupled with these factors is the expected decreasing supply of hardwood timber from natural forests over the next 20 years. Customer concerns about natural forest management and a predicted preference for wood products from certified sustainable forests will favour the development of eucalypt export markets in Europe and the United States (Flynn & Shields 1999); a well-organised eucalypt plantation sector will find the task of certification relatively easy and will be able to feed an increasing demand for certified timber on the world market.

Genetic improvement

Considerable progress has been made in the last two decades in the genetic improvement of *Eucalyptus*. Pulp and paper producers select for maximum density and minimum lignin content, charcoal producers for maximum lignin content. The high variability in and genetic control of important tree characteristics (eg fibre orientation, basic density, cracks) support high selection intensities (Assis 2000).

Hybridisation between species such as *E. grandis* and *E. urophylla* has produced good results in terms of growth performance as well as chemical and physical-mechanical wood properties. Brazilian companies such as Klabin Riocell, Aracruz and many others have also gathered experience in tissue culture propagation, which has led to significant increases in productivity.

Pests and diseases

Beside leaf-cutting ants, *Eucalyptus* plantations are not particularly prone to pest problems in Brazil. Stem canker was a severe problem in the past, particularly in *E. saligna*, but a switch to other species overcame this problem more than 20 years ago. A lack of boron causes the brushing of *E. globulus* in the stands of Klabin Riocell. *E. globulus* is also susceptible to root deformations and subsequent stem-breaks.

Ecological impact

Due to the accelerated biomass accumulation in young stands of fast-growing trees, the export of nutrients is significant in plantation forestry employing so-called mini-rotations (Poggiani et al. 1983, Poggiani 1985, Lima 1996). Under such regimes, fertilisation is usually indispensable in order to maintain long-term site productivity. The generally high demand for calcium and potassium in *Eucalyptus* plantations can be compensated for by inputs from rainwater, the recycling of biomass components, and balanced fertilisation. Preliminary results show that careful management can prevent long-term nutrient decline.

Water use in eucalypt plantations is generally comparable with that of other fast-growing plantation tree species and natural forests. However, a significantly lower water use efficiency can be observed when roots have access to free available soil water and atmospheric demand is high (eucalypts exhibit no stomatal regulation of transpiration). In those cases, eucalypt plantations justify their reputation as 'water pumps' (Calder et al. 1992). Several studies have revealed that water use efficiency is genetically controlled, suggesting that genetic improvement might produce stock with greater drought resistance.

The low degree of diversity in monospecific *Eucalyptus* plantations can be improved by introducing a variety of shade-tolerant, naturally regenerated tree species in the understorey. To increase diversity at a landscape level, eucalyptus stand complexes should be interspersed with natural forest remnants, especially in riparian zones.

Eucalypts will continue to dominate Brazil's plantation sector for pulpwood and increasingly for sawnwood. Continued research is needed to improve quality and productivity and

to ensure that the environmental impacts of eucalypt plantations are benign.

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A longer paper on this topic prepared by the authors can be obtained by contacting Dr Seling at the address above.

Cruising with Aracruz

Eucalypt islands: the Aracruz eucalypt estate is interspersed with reserves of native vegetation. These reserves are rich in biodiversity, including more than 400 different bird species, 15 of which are endangered. *Photo courtesy Aracruz Celulose SA*

Brazil's Aracruz Celulose SA is the world's largest producer of bleached hardwood kraft market pulp. This kind of pulp is used in the manufacture of high-quality paper products, including premium tissue, printing, writing and specialty papers. It's called 'market' pulp because the company does not have integrated papermaking facilities and sells its entire production of pulp on the open market.

The company's output is based on a eucalypt plantation estate of about 144 000 hectares located in the states of Bahia and Espirito Santo on the Atlantic coast. In 2000 the company produced 1.27 million tonnes of kraft pulp, mostly for export (predominantly to North America, Europe and, to a lesser extent, Asia). Its operating revenues were US$732 million in that year and its net income US$201 million. This was a steep rise over 1999, when net income was US$91 million, which itself was a dramatic improvement on the 1998 figure of only US$3.4 million; much of the increase can be attributed to fluxes in the market price of pulp. The company paid US$82 million in taxes in 2000, up from US$16.7 million in 1999.

Aracruz has been criticised in the past because its plantation estate was established on the ancestral land of the Indigenous Tupinikim community. After protests in the 1990s, the community is now being supported through a 20-year financial package: by the end of 2000, Aracruz had transferred a total of R$6.7 million (about US$2.7 million at July 2001 exchange rates) to the Tupinikin and Guarani Indigenous communities and is committed to a total aid package of US$12 million. This illustrates the point made by Julian Evans (page 3) that plantation developers must ensure they have unencumbered right to the land before commencing a plantation project. Moreover, it shows the importance of stakeholder participation, or 'buy-in'; given the long-term nature of plantation forestry, an harmonious social setting is crucial.

Despite these troubles, Aracruz has a hard-won reputation as a progressive company with good environmental practices. For example, its estate includes 66 000 hectares of native forest reserves, and it also manages a large forest rehabilitation outreach program.

Although predominantly a pulp producer, Aracruz is also developing a sawnwood sector. In 1999 it commissioned a US$52 million sawmill to process an annual 100 000 m^3 of hardwood from its eucalypt plantation estate. The basic resource is called Lyptus, a registered trade name, and is derived from a hybrid of *E. grandis* and *E. urophylla* grown on a rotation of 15 years.

According to company publicity material, Lyptus is particularly suitable for high-quality furniture: "The warm colour, pleasant grain and hardness make it a welcome alternative to traditional hardwoods". It comes in at least four classes: the 'prime' grade is 10 cm wide and 1.83–4.88 m long, with clear wood on its best face. The success of Lyptus in the market will be watched closely: some wood technologists contend that fast-grown trees cannot produce high-quality timber. If Aracruz proves them wrong it will have major implications for plantation growers everywhere.

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Compiled by the ITTO Secretariat.

Collective learning: lessons from Ghana

A local-level approach to understanding and addressing environmental constraints is empowering a community to improve

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Learning by doing: the Charia community recognises tree-growing as a way of arresting land degradation and providing livelihood opportunities. *Photo: C. Dakubo*

THIS article reports on a community development project conducted in Charia, a small village located 8 km northwest of the town of Wa in the Upper West Region of Ghana. The village has a population of about 2 500 people, 70% of whom have no formal education and are mainly peasant farmers.

Like most rural communities in northern Ghana, the community in Charia faces persistent environmental problems, including widespread soil erosion, nutrient-poor soils, overgrazing, drought and desertification. The livelihood of the community is also affected by health, education, socio-economic and political problems.

The perception of many outside researchers is that communities like Charia lack the knowledge, skills and motivation to find solutions to their problems and must therefore rely heavily on help from governmental and non-governmental agencies. Such outsiders are often authorities in specific disciplines; they take it upon themselves to collect information, diagnose the problem, design a solution, prescribe it to the community and then, often, leave.

This sort of approach is only occasionally effective. It falls short of what is required in most community development and natural resource management situations; in particular, the risk is that it fails to teach the target community the processes of problem-solving and decision-making, thus creating a spiral of increasing dependence on external help.

Action research is one alternative to the outside expert approach. The action researcher focuses on the problem-solving process rather than on the substance of the problem itself. Community members and other stakeholders are recruited as co-researchers and participate actively in the entire research process. Collectively, they decide the focus of knowledge generation, collect and analyse data, and take action to solve the community's problem (Deshler & Ewert 1995).

The study in Charia

This study was an attempt to carry out a participatory action research intervention in the Charia community. One objective was to foster learning within the community about events surrounding it and about the role of community members in influencing such events for a better future. The study also sought to help the community become self-sufficient in its ability to manage inquiry, problem-solving and decision-making processes. Community members and departmental heads of associated government institutions such as adult education, forestry, agriculture and community development were recruited as co-researchers and participated actively in all stages of the research process; participation was facilitated through the use of strategic planning, workshop and focused conversation methods.

Strategic planning

The strategic planning process is designed to assist groups in developing common goals and searching for a desirable future for a shared activity. It is designed to tap the knowledge base of participants in ways that capitalise on group dynamics and group learning. Spencer (1989) outlines five steps in the process:

1) *practical vision:* visualisation of the desired future the community wants to move towards;
2) *underlying contradictions:* recognition of those obstacles or blocks preventing the realisation of the desired future;

3) *strategic directions:* broad proposals that eliminate or circumvent the obstacles;

4) *systematic actions:* specific actions developed for each strategic direction; and

5) *implementation timeline:* an implementation plan that outlines all practical tasks of each action plan.

The consultative process in Charia took the form of a series of workshops involving community members, departmental heads and extension workers, and community leaders. A workshop was held for each step of the strategic planning process; 'focused conversation' techniques were used in conjunction with the workshops to help participants reflect on their ideas, put things into perspective and respond creatively.

Community workshops

Prior to the 'vision' workshop, participants were shown a documentary video on sustainable landuse and agroforestry practices adopted by some neighbouring communities. Using reflective dialogue, workshop participants discussed the contents of the video, the issues impeding their own community from undertaking similar activities, and what it would take to emulate their neighbours. Participants recognised that the community had once been blessed with fertile soils, abundant tree cover, sufficient food and healthy lifestyles, but that each of these indicators had declined in recent years. They agreed that the present, undesirable situation could be attributed to activities such as indiscriminate tree-felling and bush-burning and to a lack of enthusiasm in educative programs. They then envisioned some desirable elements they would like to see in their own community. These included improved agricultural practices, increased afforestation and agroforestry activities, improved health care, good infrastructure and financial self-sufficiency.

An analysis of the major roadblocks obstructing the realisation of this vision included land and resource use conflicts, poor agricultural extension strategies, unfavourable climatic conditions, disunity and a lack of commitment among community members. To address these obstacles, participants suggested broad proposals such as the need for more effective information dissemination strategies, streamlined conflict-resolution mechanisms, participatory environmental awareness campaigns and the initiation of self-help projects. A systematic action plan was developed and community members began to establish private woodlots and tree nurseries. They also participated in large-scale tree-planting exercises, began to organise regular community meetings and took keen interest in adult education and self-help projects. In addition, participants felt empowered and began to take responsibility for their own situation.

Workshop with departmental heads

Given the insights gained from the community workshops, a follow-up workshop was organised with community leaders and the local heads of government departments. They analysed the information gathered from the community workshops and discussed how they shared the community's vision of a sustainable community. They also devised strategies for pooling departmental resources so as to help the community realise its vision. There was general agreement among departmental heads to use more practical ways of disseminating information to people, and also to incorporate traditional knowledge in decision-making. They also agreed to place the locus of decision-making in the community and to use strategies that will provide members with the opportunity to participate actively in all stages of projects. Departmental heads agreed to hold regular inter-departmental workshops, coordinate their interventions in the community, and work together as a team.

Conclusion

The entire consultative process proved to be a great learning experience for all participants. The intervention served the dual purpose of teaching community members the processes of problem-solving and decision-making, and helping to solve practical community problems. Group facilitation tools such as the strategic planning process and focused conversation were effective in getting community members to generate ideas, discover common ground, define their own objectives and identify the paths to achieving and implementing such objectives.

Involvement in such processes allows for adaptive learning and development. By participating in the investigation and analysis of the problems facing them, people gain specific insights and new understanding about their situation, acquire new knowledge and gain the skills needed to solve problems. People are also more likely to be committed to the plans they make because the plans reflect their own thinking, thus creating a strong sense of ownership. If maintained, this approach can improve livelihoods and help maximise the benefits of external assistance.

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Security: an essential element for community-based plantations

Deforestation in the Philippines has been blamed for widespread land degradation, particularly in the highlands; the country faces a massive task in reforesting such lands. In 1995, ITTO Project PD 130/91 Rev. 2 (F) tested combinations of five site preparation treatments and four nursery fertiliser application treatments on 100 hectares of trial plantations. Subsequently, Project PD 21/97 Rev. 2 (F) began in 1998 with the aim of establishing and managing about 1 500 hectares of community-based forest plantations and a similar area of remnant natural forests. The results of the project will help inform policies to accelerate community-based plantation establishment and natural forest management countrywide.

The project's strategy is based on the notion that people will become able and effective managers of the forest lands and resources upon upon which they depend if they are given adequate control of those resources. With its links with government, the project has been able to facilitate the implementation of a Community-based Forest Management (CBFM) agreement. CBFM is a nation-wide initiative designed to give local people resource security if they undertake community forestry.

In 2000, an evaluation team conducted a mid-term evaluation to assess the project's achievements and shortcomings and to recommend what changes in implementation, if any, were needed. The review found that the extent and quality of community participation in the project was strong and potentially sustainable. It based this finding on two indicators:

- there were strong incentives in the form of: human resource development through training, workshops and cross-farm visits; technical assistance in nursery, plantation and protection operations; and socio-economic incentives in the form of secure land tenure and the equitable sharing of benefits from the project. All these have motivated farmers to become increasingly involved in project implementation; and
- the long duration of technical assistance and the long-term nature of the incentives under the CBFM agreement granted by government.

ITTO Secretariat

Native species in plantation: Cordia alliodora

This neotropical species is widely used in plantations within its natural range. Caution should be used when planting it offsite

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TROPICAL plantations can provide fuel, timber and other crops; contribute to site restoration; and reduce the conversion of forestland to alternative land uses. The species and provenances used, however, must be matched to site conditions and objectives so that plantation functions and ecosystem processes are complementary. If sufficient information is available to guide site selection, plantation establishment and management, native species may offer both ecological and economic advantages over non-native or 'offsite' species.

Cordia alliodora, a shade-intolerant, semi-deciduous neotropical tree, is an example of a species that may be well suited for plantations within its natural range, which extends from Mexico to Argentina and includes the Caribbean. The tree is commonly used in Central and South American agroforestry systems because it provides shade to understorey crops and, when harvested, yields wood comparable in appearance and properties to mahogany (*Swietenia macrophylla*), teak (*Tectonis grandis*) and walnut (*Juglans regia*). It captures a site quickly by investing in aboveground biomass (Haggar & Ewel 1995) and may contribute to site nutrient retention (Ewel 1999). These characteristics, together with a favourable price for its wood, suggest a role for the species in reforestation projects for site restoration, wood production and carbon sequestration.

However, there are important potential limitations to the use of *C. alliodora* in plantation. Given its observed invasive tendencies (Tolfts 1997), it may not be appropriate to introduce the species outside its native range; screening trials for invasibility should thus precede offsite establishment. The susceptibility of *C. alliodora* to competition from grasses during establishment, perhaps because of low initial resource allocation to roots, is another important consideration. For this reason, it may not be a good candidate in afforestation programs, especially on fallow pastureland or sites with extensive herbaceous vegetation.

Mixed-species vs monoculture

C. alliodora can be grown either in mixed-species or single-species (monoculture) plantations, depending on site objectives. Previous studies of its performance in plantations are dominated by mixed-species systems and research on its form, growth and yield in monocultures is limited. Its open-crown architecture is valuable if filtered light to other plantation species is desired. In such plantations, *C. alliodora* should be planted with species that have different architectures and light requirements (Menalled et al. 1998) to improve site nutrient use efficiency. In contrast, understorey vegetation may compete for resources during the establishment of monoculture plantations and thus will need to be controlled. To improve the performance of *C. alliodora* in monoculture, data are also needed on the different components of tree growth and form at different tree ages and plantation densities. These data would modify existing taper equations and volume tables currently based on open-grown trees, and would help refine the preliminary density management diagram developed for *C. alliodora* (Hummel 1997).

Site

Site selection is important. *C. alliodora* has a high demand for macronutrients such as nitrogen and phosphorus; growth can suffer from belowground competition when resources become limiting (Hiremath 2000). Reducing understorey competition by planting at high densities may not therefore be feasible in monocultures; instead, site fertility may dictate maximum density.

Form

C. alliodora often has forked stems and branches that decrease merchantable wood recovery. Data on stem form and pruning associated with spacing will help improve silvicultural treatments in plantations. Lower branch self-pruning in *C. alliodora* does not appear to be density-dependent (Hummel unpublished data) and silvicultural treatments to increase wood product yield could therefore include manual pruning. Although this would undoubtedly increase the income received by landowners, additional information on net financial returns is needed to fully assess the economics of different management options for the species.

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Dr Hummel's work on Cordia alliodora *has benefited from an ITTO Fellowship grant.*

Economic agents, as they attempt to maximise their well-being, will show interest in investing in forest plantations under conditions that will make them expect an economic advantage with reasonable certainty. However, even with accessible markets and well-defined property rights, not all land previously covered with natural forests will satisfy these conditions. Some will be dedicated to sustainable forms of land-use with higher economic advantage than forestry (such as permanent agriculture or urban development); some other areas will support forest plantations; and finally the least productive areas will probably remain as open-access land where no long-term investment can be expected.

The policy environment can have a major effect on the size of the area devoted to forest plantations. Public policies can be of several kinds, from macroeconomic measures and broad-based institutional reforms, to very specific instruments and prescriptions focusing on particular sectors. The economic agent, especially when facing opportunities for long-term investments, will react favourably to a stable and coherent policy environment, and therefore policy options must be analysed with explicit consideration of how they interact with each other.

Investments in forest plantations take place in countries at different stages of development and with different socio-political systems. Despite the differences, three fundamental elements seem to constitute the basis for forest plantation development. The forest plantation experience, over time and throughout the world, has shown that, other things being equal, the more open the markets, the better defined the property rights and the more stable the policy context, the better the opportunities for forest plantation investments.

Fundamental vs secondary considerations

Sector-specific policy instruments such as special fiscal treatments, subsidies, concessional financing and harvesting restrictions in natural forests may contribute to the creation and maintenance of forest plantations, but they can be considerably more effective if the three fundamentals are present. In some cases (eg Brazil, Chile, France, New Zealand) it is apparent that forest plantations can continue to prosper after specific incentives have been significantly reduced, but not in the absence of the three fundamentals.

Perhaps the most important lesson for policymakers is that they must understand these fundamentals, how they interact with each other, and under what conditions they create opportunities that make forest plantations a competitive land-use. A corollary lesson would be that policymakers should not confuse the secondary with the essential. This is especially important, since sector-specific policy instruments such as favourable tax treatments, subsidies and concessional financing all represent costs to the economy at large.

In numerous cases, forest plantations have shown good performance as sustainable land-use investments. Forest plantations continue to expand in several countries; in some, like Chile and New Zealand, plantation wood has almost completely replaced natural forest timber as a raw material for wood-based industries.

Plantations to grow?

FAO has worked on projections of the potential contribution of forest plantations to industrial wood and fibre supply in the coming decades. Wood from natural forests should continue to provide a major share of industrial wood and fibre raw materials for the next 50 years. However, plantations are expected to provide an increasing share of total industrial requirements and may even contribute a larger share than natural forests by the end of this period. Whether this happens or not will depend on maintaining and further developing favourable conditions for forest plantations to compete as long-term investments against other land-use options. The perspective of policymakers, particularly in the developing world, with respect to the fundamental factors of accessible markets, clear property rights, and consistent overall policy environments, will be the key to an increasing contribution of forest plantations to reducing the pressure on natural forests.

ITTO Fellowships offered

ITTO offers fellowships through the Freezailah Fellowship Fund to promote human resource development and to strengthen professional expertise in member countries in tropical forestry and related disciplines. The goal is to promote sustainable management of tropical forests, the efficient use and processing of tropical timber, and better economic information about the international trade in tropical timber.

Eligible activities include:

- participation in short-term training courses, training internships, study tours, lecture/ demonstration tours and international/ regional conferences;
- technical document preparation, publication and dissemination, such as manuals and mongraphs; and
- post-graduate studies.

Priority areas: eligible activities aim to develop human resources and professional expertise in one or more of the following areas:

- improving the transparency of the tropical timber market;
- improving the marketing and distribution of tropical timber species from sustainably managed sources;
- improving market access for tropical timber exports from sustainably managed sources;
- securing the tropical timber resource base;
- improving the tropical timber resource base, including through the application of criteria and indicators for sustainable forest management;
- enhancing technical, financial and human capacities to manage the tropical timber resource base;
- promoting increased and further processing of tropical timber from sustainably managed sources;
- improving the marketing and standardisation of tropical timber exports; and
- improving the efficiency of tropical timber processing.

In any of the above, the following are relevant:

- enhancing public relations, awareness and education;
- improving statistics;
- research and development; and
- sharing information, knowledge and technology.

Selection criteria: Fellowship applications will be assessed against the following selection criteria (in no priority order):

- consistency of the proposed activity with the Program's objective and priority areas;
- qualifications of the applicant to undertake the proposed fellowship activity;
- the potential of the skills and knowledge acquired or advanced under the fellowship activity to lead to wider applications and benefits nationally and internationally; and
- reasonableness of costs in relation to the proposed fellowship activity.

The maximum amount for a fellowship grant is US$10 000. Only nationals of ITTO member countries are eligible to apply. The next deadline for applications is **13 March 2002** for activities that will begin no sooner than July 2002. Applications are appraised in May and November each year.

Further details and application forms (in English, French or Spanish) are available from Dr Chisato Aoki, Fellowship Program, ITTO; Fax 81–45–223 1111; itto@itto.or.jp (see page 2 for ITTO's postal address).

Planting ideas

A survey of tropical timber traders suggests that plantation wood will increasingly replace natural forest timbers in further processing—with major implications for the sector

by Mike Adams

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IN JULY this year, subscribers to the ITTO *Market information service* (MIS) were canvassed for their opinions on trends in added value production. The results point to some significant changes in raw material sources and the future importance of plantations in added value manufacture.

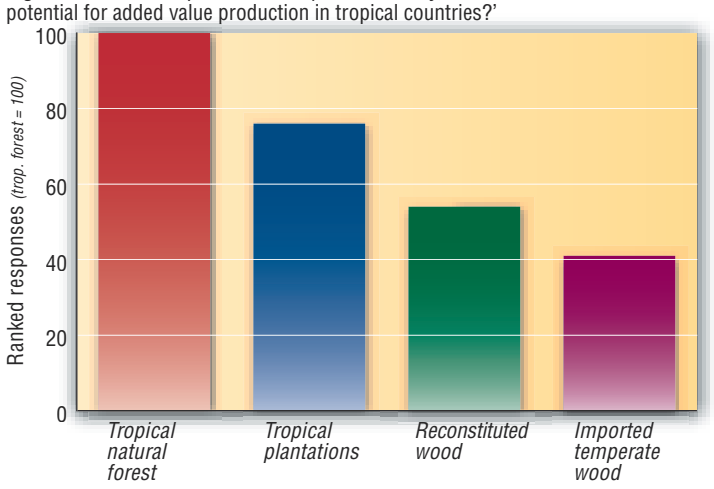
Added value products, sometimes referred to as secondary processed wood products (SPWP), include: wooden furniture (accounting for around 65% of the value of world trade in processed wood products), builders' woodwork (mouldings, joinery and other building items), products for domestic/decorative use (wooden tableware, ornaments, picture frames etc), packaging and pallets, and other wooden manufactured items such as tool and broom handles and so on.

The world trade in SPWP is estimated to have been just under US$50 billion in 2000, with ITTO producer member countries contributing around 10% of that. While this contribution may seem small it has more than doubled since 1991 and is the result of tremendous growth in SPWP exports in Malaysia, Indonesia, Thailand, Brazil and the Philippines. Malaysia and Indonesia both export over US$1 billion in SPWP; see *TFU* 11/1 for a more detailed look at the downstream processing sector in ITTO producer member countries.

The *MIS* survey received some 100 usable responses from tropical timber traders from the three tropical regions and also from Europe, North America and Australia. Respondents were asked to nominate what they thought were the key sources of raw materials for added value product manufacture in tropical countries today, and what they would be in ten years' time. *Figure 1* shows that in the view of respondents, natural tropical forests today provide the bulk of the resource for SPWP manufacture, followed closely by plantation timbers. The latter include the huge rubberwood plantation resource in Malaysia, Indonesia and Thailand that forms the backbone of added value manufacturing in those countries. Respondents ranked reconstituted wood products (such as medium density fibreboard—MDF—and other fibreboards as well as particleboard) and imported temperate wood more lowly.

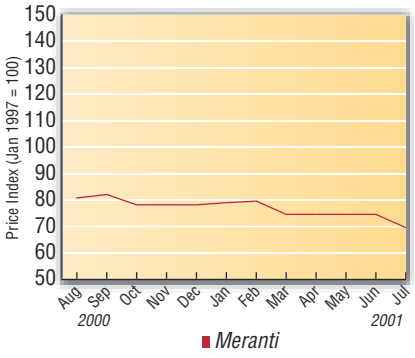
Natural supply

Figure 1: index of responses to the question: 'today, which resource offers the best potential for added value production in tropical countries?'



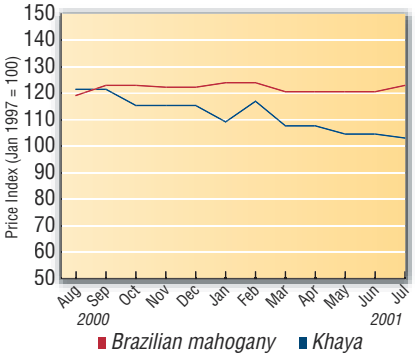
On a downer

Tropical sawnwood FOB price trends for Southeast Asian meranti *(12 months to July)*



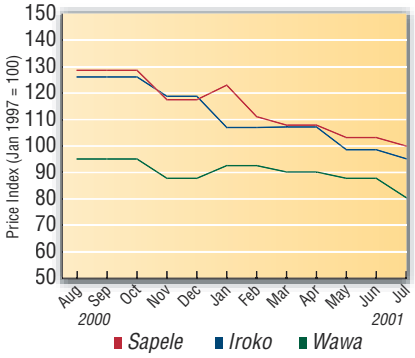
Mahogany movements

Tropical sawnwood FOB price trends for African and Brazilian mahogany *(12 months to July)*



Hard times

Tropical sawnwood FOB price trends for West African hardwoods *(12 months to July)*



What a difference ten years make

According to survey respondents, the next ten years will see a major shift in raw-material supply for SPWP away from timber grown in natural forests. *Figure 2* shows that tropical plantations were predicted to become the most important source of supply within ten years. The natural tropical resource was relegated to second place alongside reconstituted fibres.

These projections must be viewed for what they are: the conjecture of a few busy traders. However, they do provide some insight into how the sector views its future development. If it follows the course suggested by the projections, the implications for the processing sector and for the market are far-reaching. For the miller, the species mix will change, logs will get still smaller, milling characteristics—saw blade configuration and tooth design—will change, handling systems may need modification, and drying and treatment requirements will need to be altered.

For the manufacturer, the machining characteristics of plantation logs will be different compared to the current natural resource, as will be the strength, colour and texture ranges, with implications for end-product design. This, in turn, will have far-reaching implications for marketing: we will see a shift from a wood product that is red/brown with natural attractive grain to a lighter-coloured wood with fewer attractive features. If production shifts from solid hardwood processing to the processing of reconstituted products, complete mill re-tooling would be required.

Change the only certainty

If any one thing is certain it is that changes in the resource base in tropical countries and in market demand will

continue and the pace of change will accelerate. For a fast-growing plantation crop, even 10–15 years is a long time in today's economy, where events in faraway places can have an immediate effect on our own doorstep. Market demand will change, there will be profound shifts in sources of supply, and the distinctions between softwood and hardwood and tropical and temperate timber will diminish; the costs of trade will come down and technology will generate new composite products. Domestically grown plantation wood products will be competing directly in the domestic market with imports of radiata pine, US hardwoods and Russian softwoods and with alternative and substitute materials.

Mix and match

To be successful, plantations must take full advantage of the specific growing conditions for each and every site. All too often in plantation programs, opportunities to match site to species are missed in the rush to plant. My very first managerial job was as marketing manager with a plantation project in Zambia. Tens of thousands of hectares of *Eucalyptus grandis* plantations had been established, the objective being to provide raw material for a pulp mill that would be built as the resource matured. Half way into the nine-year rotation, studies revealed that a pulp mill was no longer financially feasible. In tackling the task of finding markets for a wood that was hardly suited to anything but pulp, it was disappointing to see the blanket way in which the eucalypts had been planted—over good and bad sites regardless.

Careful planning and imaginative selection of species to suit available sites and future markets is the way to go. As a timber technologist I was taught that if foresters could provide a continuous and large supply of any species then technology would provide the answer on how to use the wood. I do not believe that any longer. Zambian *Eucalyptus* taught me that and I suspect we may all learn the same lesson with *Acacia mangium* in Southeast Asia.

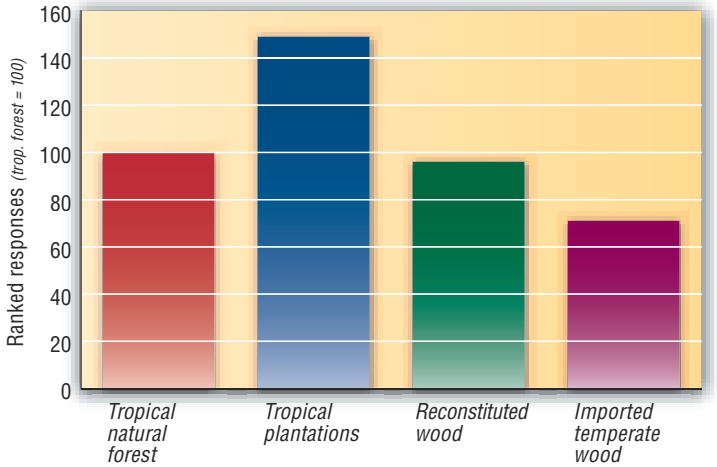
The harvest from natural tropical production forests is being reduced to achieve sustainable management and the timber industry, which provides a livelihood for millions of workers in the tropics, is getting smaller. These pages have, in the past, painted something of a depressing picture for the tropical timber trade: attacked—sometimes unfairly—on all sides for its environmental performance, and with a declining resource base and a disappearing market.

The future for the sector lies in being ready to adjust production technologies and marketing to a mixed resource of natural tropical and commodity plantation timbers. Imaginative applications of technology and good market promotion can revitalise the timber industry and help create much-needed employment. Countries with a timber industry have a hardworking workforce with good wood-processing skills. In many countries, a strong timber research capability is in place to support industrial revival. Trees grow fast in the tropics: well planned and executed, a forest plantation program can provide raw materials to meet the demands of the global marketplace and take back the market share that has been lost in the last decade or so.

To do so, though, the manufacturers of today must be prepared for tomorrow. They must be flexible in approach, open to new ideas, and well informed about the global marketplace in which they are operating.

Plantations take over

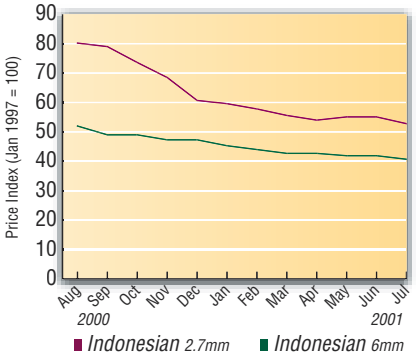
Figure 2: index of responses to the question: 'in ten years, which resource will offer the best potential for added value production?'



No-buy ply 1

Price trends for Indonesian plywood

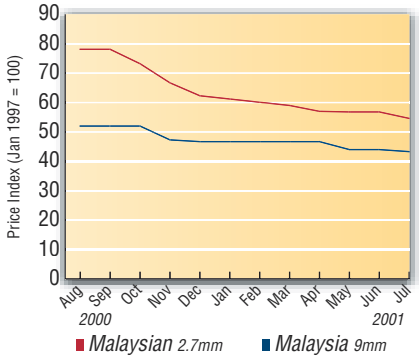
(12 months to July)



No-buy ply 2

Price trends for Malaysian plywood

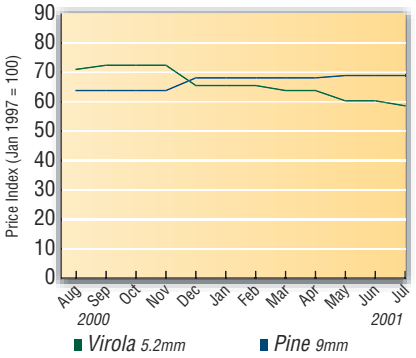
(12 months to July)



No-buy ply 3

Price trends for Brazilian plywood

(12 months to July)



Briefing on ITTO's project work

The projects and pre-projects described below were financed at the 30th session of the International Tropical Timber Council held in Yaoundé, Cameroon last May/June

Extension and consolidation of the national forest statistical information system (Bolivia; PD 34/00 Rev.2 (M))

Budget ITTO: US$352 005
Government of Bolivia: US$206 248
Total **US$558 253**

Implementing agency Bolivian Vice-ministry of Agriculture & Fisheries, Ministry of Agriculture & Rural Development
Funding country Japan

This project will build on the forest statistical information system developed under a previous ITTO project to improve the knowledge of forest products production and trade and assist efforts to increase the share of these products in the total exports of the country.

Development and implementation of guidelines to control illegal logging for sustainable forest management in Indonesia (Indonesia; PD 74/01 Rev.1 (M))

Budget ITTO: US$665 850
Government of Indonesia: US$75 250
Total **US$741 100**

Implementing agencies Indonesian Ministry of Forestry (MoF) & the World Wide Fund for Nature (WWF) – Indonesia
Funding countries Japan, USA

This project will implement a pilot study on ways to control illegal logging in production and protected areas in Riau and West Kalimantan. Outputs from the study will be used to develop guidelines for overcoming illegal logging nationwide.

Integrated management of commmunity forests in the Mefou and Afamba Valley (Central Province Cameroon) (Cameroon; PD 28/00 Rev.2 (F))

Budget ITTO: US$563 265
Government of Cameroon: US$262 200
Total **US$825 465**

Implementing agency Cameroon Forestry Department, Ministry of the Environment and Forests, through the Community Forests Unit
Funding countries Japan, USA, Republic of Korea

This 3-year project aims to halt the decline and degradation of the forest resources in the Mefou and Afamba Valley by involving local communities in the rehabilitation of degraded lands and in the establishment and management of forest plantations. Specific objectives include: developing a strategy and organisational structures for participative management of the forested areas; and establishing community forests and mechanisms for autonomous forest management by communities.

The implementation of a community-based transboundary management plan for the Betung-Kerihun National Park, West Kalimantan, Indonesia, Phase II (Indonesia; PD 44/00 Rev.3 (F))

Budget ITTO: US$764 954
Government of Indonesia & WWF Indonesia: US$149 391
Total **US$914 345**

Implementing agencies Park Management Unit of Betung Kerihun National Park & WWF Indonesia
Funding countries Japan, Switzerland

This 3-year project will establish a community-based conservation and development program for maintaining the long-term integrity of the Betung-Kerihun National Park. The aim is to create a respected, well-managed and well-functioning national park where local communities and other stakeholders actively participate in the management and receive fair benefits. Activities will include the establishment of park boundaries and management zones, the installation of basic infrastructure, studies on traditional knowledge and other socio-economic aspects, design of a database and information system, and ecological studies.

Sustainable management and rehabilitation of mangrove forests by local communities on the Caribbean coast of Colombia (Colombia; PD 60/01 Rev.1 (F))

Budget ITTO: US$583 626
CONIF/Government of Colombia: US$213 000
Total **US$796 626**

Implementing agency National Corporation for Forest Research and Development (CONIF)
Funding countries Japan, USA

This 2-year project will rehabilitate 200 hectares of mangrove forest through socially, economically and ecologically viable actions; develop appropriate practices for the sustainable management and monitoring of 1 000 hectares of mangrove resources as a strategic production and conservation alternative; and train 300 representatives of local communities in techniques and practices for the rehabilitation and sustainable management of mangrove ecosystems.

Pilot plan for the sustainable management of 10 000 hectares of secondary forest in San Lorenzo, Esmeraldas (Ecuador; PD 49/99 Rev.2 (F))

Budget ITTO: US$393 990
COMAFORS: US$50 000
Total **US$443 990**

Implementing agency Sustainable Forest Management Corporation (COMAFORS)
Funding countries Switzerland, Japan

Ecuador has more than 2.5 million hectares of logged-over natural forests. This 2-year project will establish and implement a pilot plan to facilitate the management and valuation of 10 000 hectares of secondary forests and to revert the process of forest degradation through sustainable resource management and community training. It will also provide the Ministry for the Environment with technological packages to ensure the sustainable management of secondary forests at the regional and national levels.

Conservation and development in the natural protected areas system of Tambopata (Peru) – Madidi (Bolivia) (Peru and Bolivia; PD 17/00 Rev.3 (F))

Budget ITTO: US$1 253 783
Government of Bolivia: US$133 200
Government of Peru: US$148 000
Conservation International: US$260 673
Total **US$1 795 656**

Implementing agency INRENA (Peru) & SERNAP (Bolivia) in cooperation with Conservation International and local organisations
Funding countries Japan, Switzerland, USA

This project was described in *TFU* 11/1, page 16. It was fully financed at the 30th Session of the Council with modifications to the budget, having been only partially funded at the 29th Session.

Development of an integrated regional forestry master plan for Eco-floristics Area IV in order to develop participatory forest management (Togo; PPD 11/00 Rev.2 (F))

Budget ITTO: US$72 668
Government of Togo: US$34 115
Total **US$106 783**

Implementing agency Directorate for the Protection & Control of Flora Utilisation
Funding countries Japan, USA

Eco-floristics Area IV, located in the southern part of the Togo Mountains in the west of the country, is the main forest region in Togo and an important coffee- and cocoa-growing area. This pre-project will develop an integrated regional master plan to help restore vegetation cover and thus contribute to meeting local, national and international needs for timber products while improving the living conditions of local communities.

Action plan on sustainable mangrove management (Global; PPD 17/01 Rev.1 (F))

Budget ITTO: US$181 485
ISME: US$67 786
Total **US$249 271**
Implementing agency International Society for Mangrove Ecosystems (ISME)
Funding countries Japan, USA

This pre-project will formulate a work plan for achieving worldwide understanding and collaboration for the preservation and sustainable use of mangroves.

Development of national criteria and indicators for sustainable forest management in the Congo based on the ITTO criteria and indicators (Congo; PPD 24/01 (F))

Budget ITTO: US$39 510
Government of Congo: US$6 670
Total **US$46 180**
Implementing agency Department of Forest Economy (DGEF)
Funding country Japan

This pre-project will identify and analyse the main constraints to the application of the ITTO criteria and indicators in Congo and formulate a project proposal for developing Congolese criteria and indicators at the national and local levels.

Performance evaluation of export wood furniture in relation to strength and end-use applications using established test standard (Philippines; PD 35/99 Rev. 4 (I))

Budget ITTO: US$139 999
Government of Philippines: US$227 900
Total **US$367 899**
Implementing agency Forest Products Research & Development Institute
Funding country Japan

This project will determine and evaluate the strength and performance of export wood furniture such as chairs, tables, stools, cabinet doors and drawers by the application of loads or forces simulating normal functional use, as well as acceptable mis-use, according to a graded scale of severity following established standards. It will also identify and disseminate to manufacturers designs to improve the strength and stability of furniture.

Improvement of rubberwood utilization and marketing in Thailand (Thailand; PD 51/00 Rev. 2 (I,M))

Budget ITTO: US$406 138
Government of Thailand: US$100 020
Thai Rubberwood Industry Association: US$32 230
Total **US$538 388**
Implementing agency Forest Products Research & Development Division, Forest Research Office, Royal Forest Department
Funding countries Japan, USA, Republic of Korea

This project aims to help the Thai furniture industry regain its competitive edge in world markets. Specifically, through a series of appropriate training seminars and the provision of suitable methodologies it will upgrade national skills and capabilities in rubberwood resource assessment, industrial management, processing technologies and the export marketing of furniture.

Training in reduced impact logging in Cambodia (Cambodia; PD 65/01 Rev.2 (I))

Budget ITTO: US$274 933
Government of Cambodia: US$49 000
Total **US$323 933**
Implementing agency Cambodian Department of Forestry & Wildlife
Funding country Japan

This project will train foresters, supervisors, managers and trainers from the Department of Forestry and Wildlife and the private sector, including concessionaires, in the practice of reduced impact logging, with a view to strengthening efforts towards sustainable forest management in the country. It will also establish a demonstration area in the Kompong Thom forest in central Cambodia.

Improved and diversified use of tropical plantation timbers in China to supplement diminishing supplies from natural forests (China; PD 69/01 Rev. 2 (I))

Budget ITTO: US$588 815
Government of China: US$733 150
Total **US$1 321 965**
Implementing agency Research Institute of Wood Industry, Chinese Academy of Forestry
Funding countries Japan, Australia

This project will develop and adopt an appropriate set of processing techniques for solid wood products such as joinery, furniture and building products from existing eucalypt and acacia plantations in southern China. It will also evaluate the suitability of newly planted eucalypt and acacia plantations and transfer the technologies and disseminate the scientific knowledge obtained in the project to the relevant public.

Contribution to the development of skills and technical training structures at the Mbalmayo School of Forestry (Central Province – Cameroon; PD 77/01 Rev. 2 (I,F))

Budget ITTO: US$274 880
Government of Cameroon: US$117 850
Total **US$392 730**
Implementing agency Mbalmayo School of Forestry with the assistance of the training unit of the Ministry of the Environment and Forests
Funding countries Switzerland, Japan, USA

This project will improve the expertise and structures of the Mbalmayo School of Forestry. The specific objectives are to establish an appropriate framework for the development of skills of the personnel in charge of forest management and the forest industry by improving the training structures of the School of Forestry and to develop a training and retraining master plan for the school.

Pre-project for the Ecuadorian tropical timber industry environmental management (Ecuador; PPD 15/99 Rev.2 (I))

Budget ITTO: US$71 740
Government of Ecuador: US$7 000
Total **US$$78 740**
Implementing agency Sustainable Forestry Management Corporation (COMAFORS)
Funding country Switzerland

The objective of this pre-project is to design and produce a project proposal, in coordination with the principal stakeholders (forest industries, NGOs, government and municipalities), related to the application of an environmental management system (EMS). The EMS will address timber processing industrial issues such as water consumption, energy conservation, greenhouse gas emissions, and solid and liquid wastes. The ultimate aim is to increase the international trade of Ecuadorian timber on the basis of ISO 14000 certification and to assist the forest industry to comply with environmental regulation.

Timber enhancement through mechanical processing (Republic of Congo; PPD 16/01 Rev. 1 (I))

Budget ITTO: US$47 370
Government of the Republic of Congo: US$10 500
Total **US$57 950**
Implementing agency General Directorate for Forest Economics (Direction générale de l'économie forestière)
Funding country USA

This pre-project will review the factors that result in timber losses and environmental destruction during logging, and ways of improving local timber processing to achieve greater efficiency in timber use.

Producers

Africa
Cameroon
Central African Republic
Congo
Côte d'Ivoire
Democratic Republic of the Congo
Gabon
Ghana
Liberia
Togo

Asia & Pacific
Cambodia
Fiji
India
Indonesia
Malaysia
Myanmar
Papua New Guinea
Philippines
Thailand
Vanuatu

Latin America
Bolivia
Brazil
Colombia
Ecuador
Guatemala
Guyana
Honduras
Panama
Peru
Suriname
Trinidad and Tobago
Venezuela

Consumers

Australia
Canada
China
Egypt
European Union
Austria
Belgium/Luxembourg
Denmark
Finland
France
Germany
Greece
Ireland
Italy
Netherlands
Portugal
Spain
Sweden
United Kingdom
Japan
Nepal
New Zealand
Norway
Republic of Korea
Switzerland
United States of America

Meeting urges emergency fire response agreements

FAO/ITTO International expert meeting on forest fire management

7–9 March 2001
Rome, Italy

This meeting of forest fire experts was designed to:

- examine the need and capacity of countries in predicting, preventing, managing and fighting forest fires;
- identify those countries that have such capacity and the period of the year when they could put know-how and equipment at the disposal of others who might need it;
- identify countries that could use such know-how and equipment; and
- explore the possibility of coordinating inter-country exchanges of this kind.

The experts noted that many previous consultations and meetings on forest fire management had developed recommendations that still awaited effective implementation. What was urgently needed today was an action plan specifying responsibilities and timeframes for the completion of the tasks at hand. The experts agreed that the establishment of agreements, protocols and institutional capacity to better share international fire management resources, knowledge and understanding should be an overriding priority.

The experts recommended that FAO, ITTO and collaborating agencies should support action in a number of areas, including:

- improving capacity and capability to prepare for forest fires, particularly in countries that have existing gaps in attributes such as laws, policy, planning, practices and monitoring;
- catalysing action in providing technical support to member countries in development of agreements at the bilateral and regional levels for mutual assistance in preparation for, and emergency response to, fire events;
- establish an international forest fire information centre to facilitate the sharing of worldwide information among all partners, including real-time situation reports and conditions;
- develop emergency response agreements bilaterally and multilaterally;
- activate a taskforce to track and monitor progress in the development of agreements;
- develop funding mechanisms to encourage the development of emergency response agreements;
- establish compatible incident management organisation systems in countries to facilitate the integration of international resources; and
- develop training and briefing programs for emergency response teams.

A report on the meeting in English, Spanish or French can be obtained from: Christel Palmberg-Lerche, Chife, Forest Resources Development Service, Forestry Department, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy; Fax 39–06–5705 5137; Christel.Palmberg@fao.org; www.fao.org

ASEAN action recommended

2nd ASEAN seminar on current international issues affecting forestry and forest products

20–21 July 2001
Manila, Philippines

This seminar was attended by about 90 participants from ASEAN countries, the ASEAN Secretariat, ITTO and the United Nations Environment Program. Presentations were made on regional and international issues related to forestry, forest products and biosafety. Based on two days of discussion, participants decided to make the following recommendations for the consideration of the 4th Meeting of ASEAN Senior Officials on Forestry. Some of these are summarised below:

- ASEAN member countries should develop appropriate Global Environment Facility (GEF) projects in the area of forestry within the framework of climate change, biodiversity and other relevant windows of GEF to be implemented individually or jointly;
- a workshop of ASEAN forestry experts should be convened to review the outcome of the 6th Conference of the Parties to the Framework Convention on Climate Change;
- ASEAN member countries either individually or collectively should continue to develop and implement national criteria and indicators based on both the ITTO guidelines and the framework for ASEAN Regional C&I for Sustainable Forest Management in Natural Tropical Forests. The ASEAN framework, where appropriate, should be expanded to cover plantation forests;
- ASEAN member countries should develop regional initiatives to combat illegal logging and trade of illegal timber and non-timber forest products; and
- ASEAN member countries should enlist the assistance of ITTO to further strengthen the development and implementation of C&I and forest certification through capacity building and other institutional arrangements.

For more information contact Romeo T. Acosta, Director, Forest Management Bureau, Visayas Avenue, Diliman, Quezon City, the Philippines; Tel 632–928 9313; Fax 632–925 2158; rtacosta@skyinet.net

UNFF starts up

1st Session of the United Nations Forum on Forests

11–23 June 2001
New York, USA

reported by Amha bin Buang

Assistant Director, Economic Information and Market Intelligence
ITTO Secretariat

Yokohama, Japan

The substantive outcome of this first session of the United Nations Forum on Forests (UNFF) comprised four decisions. Each is discussed below.

1) UNFF Multi-year Programme of Work, 2001–2005

In essence, the Multi-year Programme of Work is the agenda of work for the UNFF for the next five years, during which the forum will meet once a year. Sessions 2–5 will focus on a number of selected elements encompassing the principal functions of the UNFF with emphasis on the implementation of the proposals for action formulated within the Intergovernmental Panel on Forests and the Intergovernmental Forum on Forests. Accordingly, the elements to be considered at the remaining sessions of the UNFF are as follows:

(i) 2nd session: combating deforestation and forest degradation; forest conservation and protection of unique types of forests and fragile ecosystems; rehabilitation and conservation strategies for countries with low forest cover; rehabilitation and restoration of degraded lands; promotion of natural and planted forests; concepts, terminology and definitions;

(ii) 3rd session: economic aspects of forests; forest health and productivity; maintaining forest cover to meet present and future needs;

(iii) 4th session: traditional forest-related knowledge; forest-related scientific knowledge; social and cultural aspects of forests; monitoring, assessment and reporting; concepts and terminology and definitions; criteria and indicators of sustainable forest management;

(iv) 5th session: review of progress and consideration of future actions; consideration of the parameters of a mandate for developing a legal framework on all types of forests; review of the effectiveness of the international arrangements on forests.

The means of implementation covering finance, transfer of environmentally sound technologies and capacity-building will be addressed at each of the UNFF sessions in the context of the elements to be considered.

In order to strengthen the long-term political commitment to the UNFF, it has further been decided that the first ministerial segment will be conducted at the second session and the second ministerial segment at the fifth session. The convening of three ad hoc expert groups as part of UNFF intersessional work has also been recommended to address approaches and mechanisms for monitoring, assessment and reporting; finance and transfer of environmentally sound technologies; and consideration of the parameters of a mandate for developing a legal framework on all types of forests.

2) UNFF Plan of Action

The Plan of Action (POA) adopted at this first Session is an holistic and comprehensive plan focussed on the 'implementation of the Intergovernmental Panel on Forests/ Intergovernmental Forum on Forests (IPF/ IFF) proposals for action and addressing financial provisions. It is directed to countries responsible for its implementation at the national level as well as to international and regional actors and institutions for implementation at the international and regional levels and for supporting national implementation. The target of the POA is to demonstrate progress towards sustainable forest management by 2005.

Several activities at the national level and for the Cooperative Partnership on Forests (CPF) and its members have been prescribed to facilitate the effective implementation of the plan. Sixteen elements have also been listed as constituting an important tool for the implementation of the IPF/IFF proposals for action. The provision of technical assistance, technology transfer, capacity-building and financial resources needed to strengthen the capacity of institutions and instruments in the implementation of the plan has been underlined. These will be provided through bilateral and multilateral cooperation, including member organisations of the CPF; stakeholders; and domestic resources.

The importance of targets and timetables for indicating progress in the implementation of the POA has been recognised. At the national level, targets will be set by individual countries in accordance with their own priorities and national frameworks. Activities have also been prescribed for voluntary reporting by countries, regions, organisations and processes on the implementation of the plan, to commence at the second session of the UNFF.

3) Initiation of the Work of UNFF with the CPF

As the successor of the Inter-Agency Task Force on Forests (ITFF), the CPF has been established to support the work of the UNFF in achieving its objectives and in enhancing cooperation and coordination among its member organisations at the national, sub-regional, regional and international levels. In this connection, the UNFF invited the governing bodies of the member organisations of the CPF to identify practical means for mobilising their diverse strengths and resources to support the implementation of the IPF/IFF proposals for action with emphasis on country-level implementation.

4) The second session

The UNFF welcomed the offer of the Government of Costa Rica to host the second session of the UNFF and its ministerial segment in San José from 4 to 15 March 2002. It also decided on a provisional agenda for the session.

Comment

The adoption of the UNFF Multi-year Programme of Work and Plan of Action signals a new chapter in the evolution of the international forest agenda arising from the historic Earth Summit held in Rio de Janeiro, Brazil in 1992. ITTO has been actively involved in the Post Rio process from the very beginning and particularly in the IPF and IFF. From being a founding member of the ITFF established in 1995, ITTO is now a constituent member of the CPF. At its first session, the UNFF accorded observer status to ITTO and welcomed the endorsement of support for the UNFF by the International Tropical Timber Council. The Council, in turn, has adopted Decision 7(XXX), which provides, among other things, for the effective involvement of ITTO in the newly established UNFF and CPF including authorisation for ITTO's co-sponsorship of UNFF country-led initiatives and the necessary arrangements to second, as soon as possible, a highly qualified professional to the UNFF Secretariat. On the basis of this mandate, ITTO stands ready within its available expertise and resources to support the work of the UNFF and CPF towards the realisation of their respective objectives.

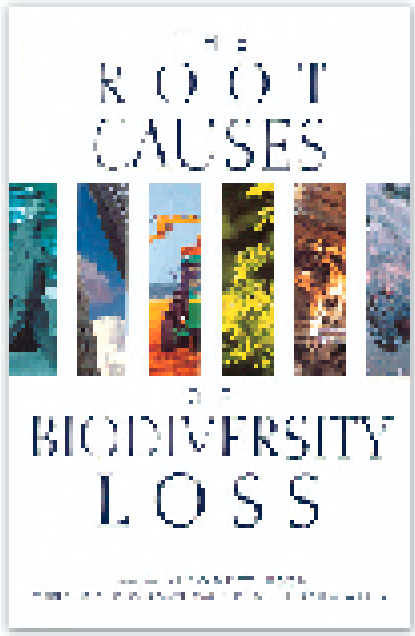
Recent editions

Edited by Alastair Sarre

Hutton, J. and Dickson, B. 2000. **Endangered species, threatened convention: the past, present and future of CITES.** ***Earthscan, London.*** **ISBN 1 85383 636 2.** ***202 pp. £14.95***

Available from: *Earthscan Publications Ltd, 120 Pentonville Rd London N1 9JN, UK; Fax 44–(0)20–7278 0433; earthinfo@earthscan.co.uk; www.earthscan.co.uk*

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) came into force in 1975 with the aim of saving wild species from extinction. It was to achieve this through the regulation and restriction of the international trade in wildlife species; its basis, therefore, was an assumption that the international trade of species was the main cause of their decline. A quarter of a century later, the collection of essays published in this book does not give a very positive review of the Convention's success. Focusing as it does on the international trade of wildlife large enough, furry enough or otherwise valuable enough to attract the interest of wildlife traders it does little, if anything, to halt habitat destruction, believed by most to be the biggest single cause of biodiversity loss. After presenting four case studies—rhinos, elephants, tigers and bears—Michael 't Sas-Rolfes concludes that "the most serious shortcoming of CITES is its narrow focus on restricting trade. Trade itself is not bad for conservation. … The future of successful conservation lies in recognizing instances where trade can be beneficial to a species, and creating a mechanism that encourages sustainable use and legal trade, while discouraging unsustainable and illegal exploitation."



In another essay, Barnabas Dickson compares two models of wildlife governance, global regulation and communal management: "The defenders of global regulation have no persuasive explanation of why states of the North can be trusted to promote sustainable use. The advocates of communal management, while they often acknowledge the importance of external factors in determining the success of devolved proprietorship, have not yet demonstrated that it is always possible to realize a supportive context for local management. If the 25 years of CITES has taught us anything, it should be that conservation policy is much more complex and involves many more different types of consideration than was originally assumed by CITES."

Nooren, H. and Claridge, G. 2001. **Wildlife trade in Laos: the end of the game.** ***Netherlands Committee for IUCN, Amsterdam.*** **ISBN 90-75909-07-1.** ***304 pp.***

Available from: *Netherlands Committee for IUCN, Plantage Middenlaan 2B, Amsterdam, the Netherlands; www.nciucn.nl*

This book canvasses the history and current state of the wildlife trade in Laos and reaches a conclusion that is seemingly at odds to that reached in *Endangered species*. Reliable statistics are hard to get, but the authors conclude that the trade "is out of control in Laos and represents a nationwide epidemic that is seriously endangering the country's still considerable biodiversity values". The book provides plenty of anecdotal evidence, describing in some detail the markets, traders, middlemen, couriers and other beneficiaries of the trade; it even gives a province-by-province account.

Wood, A., Stedman-Edwards, P. and Mang, J. 2000. **The root causes of biodiversity loss.** ***Earthscan, London.*** **ISBN 1 85383 697 4.** ***300 pp. £17.95***

Available from: *Earthscan Publications Ltd, 120 Pentonville Rd London N1 9JN, UK;Fax 44–(0)20–7278 0433; earthinfo@earthscan.co.uk; www.earthscan.co.uk*

The conclusion reached by Dickson (above) is echoed in this book, which presents the results of the World Wide Fund for Nature's 'Root causes' project. After analysing ten case studies, the conclusion is reached, somewhat self-evidently, that "the race to save biodiversity is being lost … because the factors contributing to its degradation are more complex and powerful than those forces working to protect it". The book puts forward recommendations for an operational approach to addressing this loss.

Old, K., Lee, S.S., Sharma, J. and Zi, Q.Y. 2000. **A manual of diseases of tropical acacias in Australia, South-East Asia and India.** ***CIFOR, Bogor.*** **ISBN 979 8764 44 7.** ***104 pp.***

Available from: *Center for International Forestry Research, PO Box 6596 JKPWB, Jakarta 10065, Indonesia; Fax 62–251–622 100; cifor@cgiar.org; www.cifor.cgiar.org*

This manual is designed to assist plantation managers in the identification and management of common diseases in acacias. For each disease, the causal organisms, host range, known distribution, symptoms, pathology, impact and key references are given. Illustrations of the main symptoms are also provided.

FAO 2000. **Unasylva: An international journal of forestry and forest industries 1947–2000.** ***Rome, FAO. Compact disc.*** **ISBN 92-5-004529-8.** ***US$40.***

Available from: *Publication and Information Coordinator, Forestry Department, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy; Fax 39–06–5705 2151; Forestry-information@fao.org; www.fao.org/forestry*

The complete collection—some 203 editions in English, French and Spanish—of Unaslyva, FAO's quarterly international journal of forestry and forest industries, has recently been published on compact disk. Users of the CD can browse each edition, or they can use a search engine to identify specific articles by author, title, volume and issue number, publication date and language. According to FAO publicity, the collection brings together 54 years of research, knowledge and analysis into an easily navigable product. It "presents not only the evolution of FAO's Forestry Programme but also the evolution of international forestry practices, principles and issues".

Nambiar, E., Tiarks, A., Cossalter, C. and Ranger, J. 2000.* Site management and productivity in tropical plantation forests: a progress report. *Center for International Forestry Research, Bogor, Indonesia. 112 pp.

Available from: *CIFOR, PO Box 6596 JKPWB, Jakarta 10065, Indonesia; Tel 62–251–622 622; Fax 62–251–622 100; cifor@cgiar.org; www.cifor.cgiar.org*

This book presents the preliminary results of a CIFOR project on site management and productivity in tropical plantations, as presented at a 1999 workshop held in Kerala, India. Papers include information on site management and productivity in India, Brazil, Congo, China, Australia, Indonesia, South Africa and the United States.

Muhtaman, D., Siregar, C. and Hopmans, P. 2000.* Criteria and indicators for sustainable plantation forestry in Indonesia. *Center for International Forestry Research, Bogor, Indonesia. 72 pp.

Sankar, C., Anil, P. and Amruth, M. 2000.* Criteria and indicators for sustainable plantation forestry in India. *Center for International Forestry Research, Bogor, Indonesia. 72 pp.

Nair, K. (ed) 2000.* Insect pests and diseases in Indonesian forests: an assessment of the major threats, research efforts and literature. *Center for International Forestry Research, Bogor, Indonesia. 101 pp.

Available from: *CIFOR, PO Box 6596 JKPWB, Jakarta 10065, Indonesia; Tel 62–251–622 622; Fax 62–251–622 100; cifor@cgiar.org; www.cifor.cgiar.org*

The first report presents the results of field-testing during 1997 and 1998 to determine minimum sets of criteria and indicators for sustainable plantation forestry in Indonesia at the forest management unit level. The second presents results of a similar process of field-testing conducted in Kerala and Madhya Pradesh in India. The third report concludes that the insect pest that poses the most danger to Indonesian plantations is the sengon borer. This beetle can cause considerable economic damage to *Paraserianthes falcataria*, a fast-growing tree that is increasingly being used in both industrial and smallholder plantations.

Forests Monitor 2001.* Sold down the river: the need to control transnational forestry corporations—a European case study. *Forests Monitor, Cambridge, UK.

Available from: *Forest Monitor Ltd, 69A Lensfield Rd, Cambridge CB2 1EN, UK; fmonitor@gn.apc.org; www.forestsmonitor.org*

This report, the third in a series examining the impacts of transnational corporations on forests and forest peoples, discusses logging impacts in six West African countries: Cameroon, the Central African Republic, Congo (Brazzaville), Democratic Republic of Congo, Equatorial Guinea and Gabon. It is not complimentary about many of the European logging companies operating there: "Even the best … have some considerable way to go before their operations can be said to contribute to equitable long-term sustainable development for all local people …".

Otavo, E. et al. 2001.* Evaluación de los criterios e indicators para la ordenación, el manejo y el aprovechamiento sostenible de los bosques naturales en la zona piloto de El Picudo. *ACOFRE, Minsterio del Medio Ambiente, Bogotà. 200+ pp.

Available from: *Edgar Otavo, Project leader; eotavo@tutopia.com*

This document is an output of ITTO PROJECT PD 8/97 REV. 2 (F). It reports on one of two field tests of ITTO's criteria and indicators in Colombia, this one representing conditions in the country's Pacific region. The other field test was conducted in the Department of Putumayo in the Colombian Amazon. According to Antonio Villa Lopera, who visited the site of the Pacific test as part of ITTO PROJECT PD 8/93 (F), the local community and local authorities were enthusiastic participants in the test; they are keen to build their capacity to implement the criteria and indicators on a sustainable basis and to obtain more opportunities for marketing the timber they produce.

IDEAM 2000.* Condiciones ambientales y socioeconómicas del departamento del Putumayo. *Documento síntesis. 123 pp.

Available from: *www.ideam.gov.co*

Available only in Spanish, this publication contains a good deal of information on one of the main departments in the Colombian Amazon. Putumayo is an important timber-producing region for Ecuador, Peru and Colombia.

Evans, J. (ed) 2001.* The forests handbook. Volume 1: An overview of forest science; Volume 2: Applying forest science for sustainable management. *Blackwell Science Ltd, Oxford.* ISBN 0-632-04821-2 *(v. 1) and* 0-632-04823-9 *(v. 2).

Available from: *Marston Book Services Ltd, PO Box 269, Abingdon, Oxon OX14 4YN, UK; Fax 44–(0)1235–465 555; www.blackwell-science.com*

As Professor Evans notes in his preface to Volume 1, this book is not really a handbook in the traditional sense, because it is not a practical manual. Rather, it is a collection of essays by eminent academics and managers with interests in forests worldwide, with the aim of "telling a story" about forest science. It is certainly ambitious; the aim was to synthesise scientific principles and practical knowledge to illuminate the foundations that underly sustainable forest management. Professor Evans has, indeed, attempted to distill some principles—or what he calls "emerging themes"—from the pool of knowledge represented in the two volumes.

***Siyag, P. 1998.* The afforestation manual. *Siyag, Jaipur. ISBN* 81-901032-0-2. 585 pp.**

Available from: *TreeCraft Communications, 8A, Kailashnagar, Jhotwara, Jaipur 302 012, India; ssrawat@yahoo.com; www.afforestationmanual.com*

This book, dedicated to the ecological refugees of the world, provides a wealth of technical information on afforestation practice.

Tropical and topical

Edited by Alastair Sarre

Firms halt log exports from PNG

Five logging companies operating in the PNG province of West New Britain abandoned log export operations in the first half of the year because they were no longer viable, according to a report in the *National* last June. The companies ranged in size from medium to large-scale operations; one was 100% PNG-owned. The closure of the companies resulted in the loss of over 400 jobs and lost export income in excess of US$4.5 million a year.

According to the Forest Industry Council (FIC), the companies had operated on a marginal cost recovery basis in past months but even this had become unsustainable. The FIC said that rising costs, falling FOB (free-on-board) prices and rising export taxes had eliminated any positive cash returns on production. A representative of the resource owners on the Papua New Guinea National Forest Board warned that logging and log export operations would come to a halt if the government did not lower the current high export tax on logging companies.

Reported by Clement Victor

Illegal-logging team

Japan's ruling Liberal Democratic Party recently established a team to develop policies with respect to the illegal logging and the illegal trade of timber products, according to *Japan lumber reports* (13 July 2001, No 349). According to the LDP's chairman, T. Matsuoka, illegally harvested timber comprises about half of Japan's total timber imports.

Forest monitoring in Brazil

In its latest campaign against illegal deforestation and forest fire in the Amazon, the Brazilian Institute of Environment (IBAMA) has deployed more than 1 000 field agents, three helicopters, three aeroplanes, 140 vehicles and 60 boats. According to *Infoc florestal* (Bulletin No 139), the campaign is being reinforced by military police provided by the Amazon states and about 900 volunteers from the region. Meanwhile, the *O Estado de São Paulo* newspaper reported in June that IBAMA had analysed 3 000 previously approved forest management plans in the Amazon region. About 87% of these plans failed to meet the requirements of federal legislation and were cancelled. The implementation of 389 plans was considered to be in compliance with the legislation.

Reported by Mauro Reis

Bushmeat ban hardship

A report carried in the *Japan Times* (1 September 2001) suggests that a recent ban on the sale of commercial bushmeat in Cameroon has been causing hardship- and anger-among bushmeat traders, who say they received no warning of the ban and their families are now starving. David Brown, a research fellow at the UK Overseas Development Institute, is quoted as saying: "… policy [on the bushmeat trade] is being driven to an unhealthy extent by Western environmentalists for whom human welfare seems all too often a rather secondary concern."

Seeking alternatives to poaching

Despite the ban, the commercial trade in bushmeat continues in Cameroon. But the amount sold in the town of Makenene must decrease soon, according to a Yaounde-based non-government organization, the Support Centre for Women and Country Dwellers, better known by its French acronym CAFER.

CAFER presented the results of its research on alternatives to poaching in the Inoubou Valley—located in forest between Yaounde and Douala—at the second of five seminars organised recently by the Central African Regional Programme for the Environment (CARPE). According to CAFER's president, Ms Shula Albertin, the Inoubou has for years been a centre of hunting, which has led to a significant reduction in the local animal population. She said that hunting in the Inoubou Valley did not respect seasonal restrictions. "Animals are caught indiscriminately", she said.

The Inoubou Valley constitutes part of Cameroon's savannah woodland and semi-deciduous forest zone. It is rich in fauna of exceptionally varied species. Bushmeat hunted there sells like hot cakes in the little town of Makenene, which has become an obligatory stopover for travellers to and from Yaoundé, Bafoussam Bamenda and Douala. Hunting is practised by both professionals and locals.

The research conducted by CAFER was carried out with the active participation of the population, including householders, meat-sellers and other stakeholders; there was considerable agreement that a solution to intensive poaching in the area was needed urgently. This must include alternative ways for hunters and vendors to generate income.

Reported by Parfait Mimbimi Esono

Guatemala joins ITTO

ITTO recently welcomed its 57th member, the Government of Guatemala. Guatemala, located between Mexico and Honduras in Central America, has an estimated 3.8 million hectares of tropical forest and produces about 100 000 m^3 of tropical hardwood logs per year. ITTO's membership represents nearly 80% of the world's tropical forests and about 90% of the world tropical timber trade.

CIB renounces concession in northern Congo

The CIB (Congolaise Industrielle des Bois) company has announced that it will forgo the rights to about 260 km^2 of forest concession in northern Congo. The triangle-shaped area, sited between the Ndoki and Goualaougou rivers on the southern border of the Noubalé-Ndoki National Park, is particularly rich in macrofauna, including elephants, chimpanzees and gorillas. The area is to be managed under ITTO PROJECT PD 4/00 REV. 1 (F) as a buffer zone to the National Park, with the aim of ensuring the long-term integrity of the Park and the development of sustainable livelihoods for the local communities. The project will be implemented by the Wildlife Conservation Society.

Reported by Parfait Mimbimi Esono

Indonesia's new forestry minister

Indonesia's President, Megawati Soekarno Putri, recently named the ministers who will serve in her cabinet. Among the appointments is a new Minister of Forestry, Dr M. Prakoso. Mr Prakoso served for a short period as the Minister of Agriculture under the first cabinet of former President Wahid.

Logging on

Sir

I enjoyed reading the high-quality articles on reduced impact logging (RIL; *TFU* 11/2). After reading a number of the opinions I started to have trouble finding all the controversy surrounding the issue of RIL. The editorial made perfect sense and so did Mr Alf Leslie. There seems to be a lot of common ground, among foresters at least.

In almost thirty years now as a forester in soil science I have seen just about every sin in logging, from Martini plows pushing all of the A-horizon into a windrow, to deep ruts from D-8s, to exposed subsoil hardened to cement. Then there is all the leftover tree damage done to the timber still standing! I have seen some logging that makes me sick as a professional forester and university professor. I teach my forest management students one very important fact about regeneration that I never want them to forget: "Never cut a forest you cannot regenerate".

So much of the damage that occurs during logging operations is totally unnecessary and could be avoided with pro-active policies from upper-level corporate management. Never have I personally blamed loggers. Logging practices are driven by people with business degrees using spreadsheets in the front office. Loggers are told to 'get the wood out as cheaply as possible' in terms of salaries and machine operating costs. Frankly, the lowest impact logging I have ever seen was left out of the whole issue; namely, small-scale operations in teak forests in India, where dozens of workers get paid only a few rupees per day and elephants are brought in when the logs get too heavy (I'm not so sure that it is such a good deal for the workers).

There are no excuses left for bad logging practices. If the logging does not get more responsible then it is only a matter of time before it will be shut down forever in some places. The recovery time for some forests that have been 'mucked up' is probably around 200–300 years! That kind of rotation is a bit long for me. Thanks for a most stimulating newsletter.

Dr Robin Rose
Forest regeneration scientist
Director, Vegetation Management Research Cooperative
Oregon State University
Corvallis OR 97330, USA
robin.rose@orst.edu

Editor's note: see TFU *6/3 pp 8–9 (1996) for information on logging by elephant.*

Making contact

We are interested in sharing our knowledge about teak plantations, and teak processing and marketing with other people and companies. We want to make sustainable forestry an attractive sector for investors, and therefore we would like to 'educate' the markets.

Hessel van Straten,
PanAmerican Woods S.A.,
Costa Rica; Tel 31–35–640 0533; Fax 31–35–624 4933; hessel@nibo-nv.com; www.nibo-nv.com

Bonn fires up Kyoto

The deal struck in Bonn last July by the Conference of the Parties to the Framework Convention on Climate Change on the implementation of the Kyoto Protocol has been hailed by many as a step in the right direction for mitigating climate change.

Global temperatures are predicted to rise, with associated changes in global climate, as a result of increasing levels of atmospheric carbon dioxide and other 'greenhouse' gases caused by the use of fossil fuels and changes in land use (such as deforestation). The Kyoto Protocol is an agreement whereby developed countries (so-called 'Annex I' countries) have committed to reduce their net emissions of greenhouse gases to 5% below 1990 levels (although the percentage varies between countries) during what is known as the 'first commitment period' of 2008–2012.

The mechanism of most relevance to tropical forests is the Clean Development Mechanism (CDM). It was decided at Bonn that Annex I countries could claim carbon 'credits' (to be offset against their carbon emissions) for funding reforestation and afforestation projects in developing countries. Emission reductions achieved through reduced impact logging, enrichment planting or forest conservation projects will not be eligible, at least during the first commitment period.

According to Mr Satoshi Akahori, Deputy Director of Japan's Forestry Agency, who recently briefed ITTO staff on outcomes of the Bonn conference, the extent to which the agreement will lead to greater investment in plantation establishment and management in the tropics is still uncertain. The agreement limits the amount of emission reductions that can be claimed through afforestation/reforestation projects under the CDM to 1% of base-year emissions. Japan, for example, can claim up to 3 million carbon tonnes per year from afforestation/reforestation CDM initiatives during the first commitment period, which would probably require less than 1 million hectares of tropical plantations.

The next Conference of the Parties (COP 7), to be held in Marrakech, Morocco from 29 October to 9 November 2001, will take some of these issues forward. Delegates will no doubt also continue to ponder the effectiveness of implementing the Protocol in the absence of the United States, which has signalled its intention not to ratify the agreement.

ITTO Secretariat

Courses

Forestry degrees offered

The Papua New Guinea (PNG) University of Technology in Lae offers a four-year degree course in tropical forestry, the only institution in the South Pacific to do so. The course aims to provide the necessary training for forest scientists and managers, but graduates are also equipped with skills to work more broadly in natural resource management in the public and private sectors. Considerable emphasis is placed on forest management, resource inventory surveys, reforestation and afforestation techniques, wood technology and the wood processing industries, on timber harvesting practices, and on extension and advisory services.

For more information contact: *Head of Department, Department of Forestry, PNG University of Technology, Private Mail Bag, Lae 411, PNG; Tel 675–473 4651; Fax 675–473 4669; kmulung@foac.unitech.pg*

Mountain masters

A new Master of Science program in mountain forestry at the University of Agricultural Sciences (BOKU) in Vienna will start in March 2002. The two-year program provides academic training (in English) to highly qualified students and professionals who wish to specialise in mountain forestry. The curriculum emphasises interdisciplinarity and learning by doing, and fosters intercultural communication and team working, participatory thinking and bottom-up approaches.

For more information contact: *Ms Birgit Habermann, University of Agricultural Sciences Institute for Forest Ecology Co-ordination Mountain Forestry, Peter Jordanstrasse 82 A-1190 Vienna, Austria; Tel. 43–1–47654–4124; Fax 43–1–479 7896; bhabermann@woek.boku.ac.at; http://ftp-waldoek.boku.ac.at/mountainforestry/*

Research course on the formulation of integrated management plans (IMPs) for mountain forests

30 June-6 July 2002 **Bardonecchia, Italy**

This course will bring together mountain forest managers and scientists with the aim of developing guidelines for the formulation of IMPs in mountain forests. Specialists in tropical mountain forest management interested in attending should contact: Professor Gerard Buttoud, ENGREF, 14 rue Girardet, F-54042 Nancy, France; Fax 33–383–302 254 254; buttoud@engref.fr

Tropical forests masters

The Wageningen University and Research Centre in the Netherlands offers a 17-month MSc program in forest and nature conservation for tropical areas. Three specialisations are possible: policies; management; and ecology. Applicants should have a BSc in forestry, natural conservation or equivalent, fluency in English and, preferably, working experience. Applications for the 2002–2004 program close on 15 November 2001.

For more information contact: *Sub-department of Forestry, Director MSc Program Frits J. Staudt, PO Box 342, 6700 AH Wageningen, the Netherlands; Tel 31–317–47 8015; Fax 31–317–47 8078; frits.staudt@alg.bosb.wau.nl*

Community-based tourism for conservation and development

4 February–1 March 2002 **Bangkok, Thailand, and field sites**

Cost: US$ 4 300

This course is designed to develop participants' skills and awareness to successfully assess and plan for community-based tourism activities within a market context. The course focuses on participatory planning approaches that actively involve local communities in tourism development so they can derive maximum benefits and contribute to conserving the local resources (cultural and/or environmental) on which tourism is dependent. As much of the course work takes place in the field with villagers, participants must be willing to work with villagers and in a rural setting. Registration deadline: 31 December 2001.

For more information contact: *Ronnakorn Triraganon at orot@ku.ac.th or Dr Somsak Sukwong, Executive Director, Regional Community Forestry Training Centre, Kasetsart University, PO Box 1111, Bangkok 10903, Thailand; Tel 66–2–940 5700; Fax 66–2–561 4880; ftcsss@nontri.ku.ac.th; www.recoftc.org*

Tropical Dendrology

11–23 March 2002 (English)
15–27 April 2002 (Spanish)
24 June–6 July 2002 (English)
Costa Rica (San José and the field)

Cost: US$1 800

This course, which has been run annually since 1993, includes visits to four different 'life zones' within Costa Rica. Participants will gain skills in tree and shrub species identification in the American tropics using a technique developed by Dr L. R. Holdridge. They will learn to identify 70–80% of neo-tropical species to family level, and to species level for some of Costa Rica's most important species.

Contact: *Dr Humberto Jiménez-Saa, Tropical Science Center, Apdo. 5857–1000, San Jose, Costa Rica; Fax 506–253 4963; hjimenez@racsa.co.cr; www.geocities.com/hjimenezsaa*

By featuring these courses, ITTO doesn't necessarily endorse them. Potential applicants are advised to obtain further information about the courses of interest and the institutions offering them.

Call for tenders

ITTO seeks a consultancy company or other appropriate institution to conduct the ex-post evaluation of six completed ITTO projects promoting sustainable forest management in Latin America. The six are:

1) **PD 34/88 Rev.1 (F)** Conservation, management, utilization and integrated and sustained use of the forests in the Chimanes Region, Beni Department, Bolivia (Bolivia)

2) **PD 95/90 (F)** Forest management in the Alexander von Humboldt National Forest, Phases I, II, and III (Peru)

3) **PD 176/91 Rev.1 (F)** Sustained management for production, conservation, demonstration, diffusion and promotion activities in moist tropical forests in Ecuador's Northwest (Ecuador)

4) **PD 33/93 Rev.1 (F)** Conservation, management, harvesting and integrated and sustained use of forests in the Chimanes Region, Beni, Bolivia – Phase I (Bolivia)

5) **PD 18/94 Rev.1 (F)** Participatory forest development in the Alto Mayo Region for the sustainable management of moist tropical forests, Phase I and II (Peru)

6) **PD 13/96 Rev.1 (F)** Multiple-use management in the Macauã National Forest based on rubber estates – Phase I: development of a master plan to support community organization (Brazil)

The selected entity will provide services directed at establishing the projects' overall effectiveness and efficiency. It will further assess their impact on sectoral objectives and their contribution to the achievement of ITTO's Objective 2000.

Further details available from: *Executive Director, ITTO, International Organizations Center – 5th Floor, Pacifico-Yokohama, 1–1–1, Minato-Mirai, Nishi-ku, Yokohama, 220–0012 Japan; Tel 81–45–223 1110; Fax 81–45–223 1111; itto@itto.or.jp*

Tender deadline: 15 November 2001

Meetings

29 October–3 November 2001. **31st Session of the International Tropical Timber Council.** Yokohama, Japan. ***Contact:*** *Collins Ahadome; itto@itto.or.jp; www.itto.or.jp*

29 October–2 November 2001. **Forestry Extension: Assisting Forest Owner, Farmer and Stakeholder Decision-Making. 5th Symposium of the Extension Forestry Working Party.** IUFRO 6.06.03. Lorne, Australia. ***Contact:*** *Rowan Reid, Senior Lecturer in Agroforestry & Farm Forestry, Agroforestry and Farm Forestry Program, Department of Forestry, Institute of Land and Food Resources, University of Melbourne, Victoria 3010 Australia; Tel 61–3–8344 5011; Fax 61–3–9349 4172; rfr@unimelb.edu.au; www.mtg.unimelb.edu.au/iufro.htm*

29 October-9 November 2001. **7th Session of the Conference of the Parties to the Framework Convention on Climate Change.** Marrakech, Morocco. ***Contact:*** *secretariat@unfccc.int; www.unfccc.int*

30 October–2 November 2001. Forest Science and Forest Policy in the Americas: Building Bridges to a Sustainable Future. IUFRO Task Force on Science/Policy Interface. ***Contact:*** *John Parotta, USDA Forest Service R&D—SPPII, 201 14th St, SW, PO Box 96090, Washington, DC 20090–6090, USA; jparotta@fs.fed.us*

7–12 November 2001. **The VII World Bamboo Congress: Bamboo For Development.** Dehradun, India. ***Contact:*** *I.V. Ramanuja Rao, International Network of Bamboo and Rattan (INBAR) Programs Coordinator; rrao@inbar.int*

11–16 November 2001. **XV Latin American Congress of Soil Science.** Cuba. ***Contact:*** *Dr R. Villegas Delgado, Ave Van Troi No. 17203, Boyeros, Havana CP 19210, Cuba; Tel 53–7–579076; Fax 53–7–666036; XV@inica.edu.cu*

13–15 November 2001. **4th Symposium on Fire and Forest Meteorology.** Reno, Nevada, USA. ***Contact:*** *Tim Brown, Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512–1095 USA; Tel 1–775–674 7090; Fax 1–775–674 7016; tbrown@dri.edu; www.ametsoc.org/AMS*

20–24 November 2001. **4th Machinery and Timber Products Show and 5th Plywood and Tropical Timber International Congress.** Belém, Brazil. ***Contact:*** *WR São Paulo; Tel 55–11–3721 3116; wrsp@uol.com.br; www.tropicalcongress.com.br*

28–30 November 2001. **International Seminar on North-South and South-South Research Partnerships for Sustainable Development: Approaches and Experiences in Latin America.** Cartagena de Indias, Colombia. ***Contact:*** *Aixa Becerra, Cinara; Tel 57–2–339 2345; Fax 57–2–339 3289; aixabecerra@yahoo.com; www.kfpe.ch/semcol*

3 December 2001. **Annual Conference of the International Society of Tropical Foresters.** Washington, DC, USA. ***Contact:*** *Warren T. Doolittle, President, ISTF, 5400 Grosvenor Lane, Bethesda, MD 20814, USA; Fax 1–301–897 3690; istfiusf@igc.apc.org; www.cof.orst.edu/org/istf*

18–22 February 2002. **2nd International Workshop on Participatory Forestry in Africa. Defining the Way Forward: Sustainable Livelihoods and Sustainable Forest Management through Participatory Forestry.** Arusha, Tanzania. ***Contact:*** *George Matiko, Forestry and Beekeeping Division, PO Box 426, Dares Salaam, Tanzania; Tel 22–286 5838; Fax 22–286 5165; workshop@africaonline.co.tz; www.fao.org/forestry/FON/FONP/cfu/cfinfo/en/tanz-e.stm*

24–26 February 2002. **Working Forests in the Tropics: Conservation through Sustainable Management.** Gainesville, Florida, USA. IUFRO 3.00.00, 1.07.00, 1.07.20. ***Contact:*** *Daniel J. Zarin, Associate Professor, School of Forest Resources and Conservation, University of Florida, PO Box 110760, Gainesville FL 32611–0760, USA; Tel 1–352–846 1247; Fax 1–352–846 1332; zarin@ufl.edu; http://conference.ifas.ufl.edu/tropics*

4–15 March 2002. **2nd Session of the United Nations Forum on Forests.** San José, Costa Rica. ***Contact:*** *UNFF Secretariat, Department of Economic and Social Affairs, United Nations, 2 UN Plaza, 22nd Floor, New York, NY 10017, USA; Tel 1–212–963 3401; Fax 1–212–963 4260; unff@un.org.*

20–21 March 2002. **Forest Valuation and Innovative Financing Mechanisms for Conservation and Sustainable Development of Tropical Forests.** The Hague, Netherlands. ***Contact:*** *Tropenbos International, Seminar 2002, PO Box 232, 6700 AE, Wageningen, the Netherlands; Fax 31–317–495520; tropenbos@tropenbos.agro.nl; www.tropenbos.nl*

25–27 March 2002. **International Conference on Utility Line Structures.** Fort Collins, Colorado USA. ***Contact:*** *Lisa S. Nelson, International Conference c/o EDM, 4001 Automation Way, Fort Collins CO 80525–3479 USA; Tel 1–970–204 4001; Fax 1–970–204 4007; lnelson@edmlink.com*

8–20 April 2002. **Alternative Ways to Combat Desertification: Connecting Community Action with Science and Common Sense.** Cape Town, South Africa. ***Contact:*** *Ms Roben Penny, Woodbine, Essex Road, Kalk Bay, Cape Town 7975 South Africa; Tel 27–21–788 1285; robenpen@jaywalk.com; http://des2002.az.blm.gov/homepage.htm*

12–16 May 2002. **7th International Workshop on Seeds.** Salamanca, Spain. ***Contact:*** *Gregorio Nicolás; gnr@gugu.usal.es; http://www.geocities.com/workshop_on_seeds/*

13–18 May 2002. **32nd Session of the International Tropical Timber Council.** Denpasar, Indonesia. ***Contact:*** *Collins Ahadome; itto@itto.or.jp; www.itto.or.jp*

14–21 August 2002. **17th World Congress of Soil Science: Confronting New Realities in the 21st Century.** Bangkok, Thailand. ***Contact:*** *Congress Office, Kasetsart University, Box 1048, Bankok 10903, Thailand; o.sfst@nontrj.ku.ac.th*

29 July–2 August 2002. **Mountain Forests: Conservation and Management.** Vernon, British Columbia, Canada. IUFRO 1.05.00. ***Contact:*** *Tom Rankin, Forest Continuing Studies Network; Tel 1–250–573 3092; Fax 1–250–573 2882; tom.rankin@fcsn.bc.ca; www.mountainforests.net*

25–29 August 2002. **Population and Evolutionary Genetics of Forest Tree Species.** Stará Lesná, Slovakia. IUFRO 2.04.00. ***Contact:*** *Ladislav Paule, Faculty of Forestry, Technical University SK-96053 Zvolen, Slovakia; Tel 421–855–520 6221; Fax 421–855–533 2654; paule@vsld.tuzvo.sk ; http://alpha.tuzvo.sk/~paule/conference*

3–4 September 2002. **Forest Information Technology 2002: International Conference and Exhibition.** Helsinki, Finland. ***Contact:*** *Leila Korvenranta, Finpro, Arkadiankatu 2, POB 908, FIN–00101 Helsinki, Finland; Tel 358–204 6951; Fax 358–204 695 565; info@finpro.fi; www.finpro.fi*

24–25 September 2002. **Malaysian Timber Marketing Convention.** Kuala Lumpur, Malaysia. ***Contact:*** *MTMC 2002, Level 18, Menara PGRM, 8 Jalan Pudu Ulu, 56100 Cheras, Kuala Lumpur, Malaysia; Tel 603–982 1778; Fax 603–982 8999; mtmc@mtc.com.my*

29 September–5 October 2002. **International Seminar on New Roles of Plantation Forestry Requiring Appropriate Tending and Harvesting Operations.** Tokyo, Japan. IUFRO 3.04. ***Contact:*** *Japan Forest Engineering Society Office, c/o Laboratory of Forest Utilization, Graduate School of Agricultural and Life Sciences, University of Tokyo, 1–1–1 Yayoi, Bunkyo-ku, Tokyo 113–8657, Japan; Fax 81–3–5841 7553; JFES-office@fr.a.u-tokyo.ac.jp; http://jfes.ac.affrc.go.jp/iufro2002.html*

14–18 October 2002. **Interpraevent 2002 in the Pacific Rim: Protection of Habitat against Floods, Debris Flows and Avalanches caused by Heavy Rainfall, Typhoon, Earthquake and Volcanic Activity.** Matsumoto, Japan. ***Contact:*** *Japan Society of Erosion Control Engineering, Sabo Kaikan, 2–7–5 Hirakawa-cho, Chiyoda-ku, Tokyo, 102–0093 Japan; Tel 81–3–3263 6701; Fax 81–3–3263 7997; IPR2002@ics-inc.co.jp; www.sabopc.or.jp/IPR2002*

4–9 November 2002. 33rd **Session of the International Tropical Timber Council.** Yokohama, Japan. ***Contact:*** *Collins Ahadome; itto@itto.or.jp; www.itto.or.jp*

11–17 November 2002. **Collaboration and Partnerships in Forestry.** Santiago, Chile. IUFRO 6.00.00. ***Contact:*** *Susanna Benedetti, Instituto Forestal, Casilla 3085, Santiago, Chile; Tel 56–2–693 0722; Fax 56–2–638 1286; sbenedet@infor.cl*

11–15 March 2003. **Forest Products Research: Providing for Sustainable Choices.** IUFRO Division 5. Rotorua, New Zealand. ***Contact:*** *Lesley Caudwell, Forest Research, Sala Street, Private Bag 3020, Rotorua, New Zealand; Tel 64–7–343 5846; Fax 64–7–343 5507; alldiv5iufronz@forestresearch.co.nz; www.forestresearch.co.nz/site.cfm/alldiv5iufronz*

11–15 March 2003. **Properties and Utilization of Tropical Woods.** IUFRO 5.03.00 and 5.06.00. ***Contact:*** *Gan Kee SENG, Forest Research Institute Malaysia, 52190 Kuala Lumpur Kepong, Malaysia; Fax 60–3–636 7753; ganks@frim.gov.my*

8–17 September 2003. **V World Parks Congress.** Durban, South Africa. ***Contact:*** *Peter Shadie, Executive Officer, 2003 World Parks Congress, IUCN Programme on Protected Areas, Rue Mauverney 28, 1196 Gland, Switzerland; Tel 41–22–999 0159; Fax 41–22–999 0025; pds@iucn.org; http://wcpa.iucn.org*

21–28 September 2003. **XII World Forestry Congress.** Quebec City, Canada. ***Contact:*** *XII World Forestry Congress, PO Box 7275, Charlesbourg, Quebec G1G 5E5, Canada; www.wfc2003.org*

8–13 August 2005. **XXII IUFRO World Congress.** Brisbane, Australia. ***Contact:*** *Dr Russell Haines, Queensland Forestry Research Institute, PO Box 631, Indooroopilly 4068, Australia; Tel 61–7–3896 9714; Fax 61–7–3896 9628; hainesr@qfri1.se2.dpi.qld.gov.au; http://iufro.boku.ac.at*

Point of view
The plantation investment

by Juan Sève

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FOREST plantations are the result of a process, which usually includes establishment, growth and harvest. In order to be successful, this process, which implies investment, management and know-how, must be able to compete against exploitation of the natural forests. If they do, their contribution to the total production of fibre will increase, with the consequence that they will compensate demand for fibre from natural forests.

Forest plantations today

According to provisional data from FAO, there are about 180 million hectares of forest plantations worldwide, of which more than 80% have been planted for wood and fibre production. More than half of these industrial plantations are currently less than 15 years old. While forest plantations represent less than 4% of the world's forest area, they are estimated to be supplying approximately 22% of total industrial roundwood production.

An important lesson that can be derived from these figures is that forest plantations do happen, they grow and they are harvested competitively, making a measurable contribution to the world's demand for wood and fibre. The tens of millions of hectares of plantation forests in the world today reflect the fact that various economic agents—enterprising individuals, private-sector companies, communities, rural households, governments (both national and local), international funding organisations and non-governmental organisations—have invested in forest plantations expecting future benefits. Some of these investments have failed, but it is fair to say that most have been successful, as evidenced by the continued expansion of forest plantation activities, which exceeded 4 million hectares per year worldwide in the mid 1990s.

The present area of forest plantations has resulted, to a large extent, from the inclusion of plantation programs in the forest policies of many countries in recent years, especially since the mid-sixties. While the focus has been on industrial plantations, such programs have also included plantations for protection purposes, as well as for agroforestry and social forestry.

Forest plantations compete for land

Forest plantations constitute an investment—that is, the application of resources in an effort to attain a greater benefit in the future—for all economic agents, but different agents will invest their resources with different purposes in mind. For example, a private enterprise will emphasise commercial benefits, a rural household will be more interested in satisfying needs for fuelwood and fodder, and national or local governments may focus on controlling erosion, restoring watersheds, and other types of public-interest investments. One way or another, forest plantations constitute a land-use which competes with other possible land-uses for land and which involves the application of other resources, such as capital, labour and know-how, that also face other investment opportunities. In other words, regardless of the purpose of the investor, forest plantations constitute long-term commitments of scarce resources, and the decision-making agents must be motivated to undertake them.

Plantation forestry is not a simple business. On the contrary, it incurs important costs, requires significant amounts of specific know-how, and involves several factors of risk. Additionally, since the benefits are not obtained for several years, most economic agents will require certain conditions before embarking in this type of investment.

Conditions that motivate plantation investments

While there is a current emphasis on agroforestry and other forms of social forestry schemes, as well as plantations for watershed protection and other resource conservation purposes, most forest plantations have been driven in the past by production or commercial motives. Various countries have designed systems of incentives (mostly fiscal and financial) to promote forest plantations, but the expectation of commercial gain has remained the major motivating force behind most man-made forest efforts. This implies that a fundamental consideration in launching or strengthening a forest plantation program is access to a market where the proceeds of a plantation can be sold at a competitive price. Rights to use the land for establishing plantations and to sell or harvest the trees planted are another essential consideration.

Continued on page 19