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Burning Down the House

Fire is an indispensable tool. We use it in many different ways, even domestically – for cooking our food, heating our water and lighting our homes. But misuse it, and it might burn down the house.

Or the forest. There are few things more depressing than the aftermath of a tropical forest wildfire. The air is full of thick smoke. The eyes burn. There's no shade. Everything is grey. People and animals, those that survive, pick through the charred ruins of their homes and habitats. What were once grand trees are now skeletons.

Uncontrolled or misused fire wreaks havoc on society and the environment, destroying property and natural capital, depleting nutrient pools, polluting water supplies, reducing biodiversity, increasing emission of greenhouse gases, disrupting communities, decimating livestock and even killing people. Yet, because fire is a tool, humans are also the major source of ignition, and it is our activities that help create conditions in which fire can be most destructive.

Why do people light fires? Most forest fires in the tropics are started for specific purposes such as land clearing and preparation for agriculture and grazing, or for increasing the yields of some forest products. Others are caused by accidental escapes from settlements, by arson (often as a result of disputes over land ownership or management), or, less commonly, by lightning. When a fire, regardless of origin, gets out of control it becomes, by definition, a wildfire. It scorches across the landscape, burning especially well in logged and degraded forest and in poorly managed plantations.

As illustrated by articles in this edition, fire has become a major factor affecting the productivity, structure and conservation value of the tropical forests. In Southeast Asia (p 10), wildfires have destroyed millions of hectares of forest in the last decade or so. In the Amazon (p 8), fire is the main tool used to assist forest clearing, wasting millions of dollars worth of natural assets to 'clean' soil that will soon become unproductive. In Côte d'Ivoire (p 11), the death toll amounted to 21 people in the 1982/83 fire season. And if, as predicted, there is a change in global climate due to increasing atmospheric concentrations of greenhouse gases, fire could become an even more important agent of destruction (see p 6).

It seems obvious that fire is a technology out of control, but it is not so easy to see how it can be reined back in. Fire is a complex social, technological and environmental phenomenon, but it is just part of the even more complex societal and environmental matrix that has led to the high rates of deforestation and degradation we see in the tropics today.

Nevertheless, the issue is of such regional and global importance that several articles in this edition call for urgent action, while ITTO's draft guidelines on the management of tropical forest fire (see p 14) provide a comprehensive catalogue of the types of action required. Forest managers, for example, can help by spreading awareness within their own sphere of influence and by encouraging participatory approaches. A concerted effort at all levels seems imperative: after all, if one's house is on fire, to delay action would be foolhardy, to say the least.

Alistair Sarre and Johann G. Goldammer
(collaborating editor for this issue)

Houses and villages are built out of materials from the surrounding forest and grasslands and become flammable in the same rhythm of seasonality. Wildfires regularly destroy villages in many tropical countries, and, vice-versa, many forest fires originate in such settlements. Thus, forest fire management is crucial for both the people and the forest. Photo: J.G. Goldammer.

Inside this issue

Ferreira Penna Scientific Research Station

A new research centre in the Amazon should facilitate scientific research in the region

The rainforests of the Amazon basin harbour at least 50,000 species of plants and a fauna even richer than the flora. To maintain such biological richness through sustainable management regimes, increased long-term research efforts are needed.

For long-term studies, Amazonian scientific institutions have lacked representative forested areas that are not fragmented but are readily accessible. Addressing this shortfall is the newly-established Ferreira Penna Scientific Research Station, operated by the Emílio Goeldi Museum of Pará State and situated in the 330,000-hectare Caxiuanã National Forest, 400 km in a straight line from the city of Belém, capital of Pará State, in the Amazonian region.

The Ferreira Penna Scientific Research Station includes 33,000 hectares of forest, of which 80 per cent is upland tropical rainforest and 20 per cent is floodplain forest, with rivers and streams containing abundant aquatic vegetation. The region is sparsely settled, its rivers and forests are well preserved, and local biological diversity is high.

Facilities

The facilities of the research station include 3,000 m^2 of constructed area. The station contains laboratories, a library, dormitories with capacity for 100 people, scientific collection rooms, an auditorium, restaurant, computer, administrative offices and individual residences. Several motor boats serve the station.

Researchers and Visitors

The Ferreira Penna Scientific Research Station is open to all researchers and institutions with an interest in undertaking scientific research in the Amazon region. Solid projects capable of attracting funding will have the full support of the Goeldi Museum.

Interested persons and institutions should contact: Dr Pedro L. E. Lisboa, Coordinator, Scientific Research Station Ferreira Penna, Museum Emílio Goeldi, Av. Magalhães Barata, 376–66.040–170, Belém, Pará, Brazil. ■

Docking point for the Ferreira Penna Scientific Research Station, in the lower reaches of the Amazon basin.

International Meeting on Community Forestry

In conjunction with the 20th Session of the International Tropical Timber Council and with sponsorship from ITTO, the Department of Environment and Natural Resources (DENR) of the Philippines is organising an 'International Conference on Community Forestry: as a Strategy Towards Sustainable Forest Management'. It will be held in Manila from 24–26 May 1996. For more information, contact: Mr Jose D. Malvas, Jr, Director, Forest Management Bureau, DENR, Visayas Ave, Diliman, Quezon City, Manila, Philippines; Ph 63–2–927 4788; Fax 63–2–920 0374.

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Regular Features

Fire in Tropical Forests

An overview of fire management issues and options in tropical forests

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Today, the vast majority of the world's vegetation fires – uncontrolled wildfires, intentionally set fires in forests, savannas, grasslands and other wildlands, and agricultural burning – is human-caused and takes place in the tropics and subtropics.

In recent years, extended droughts together with the rapidly increasing exploitation of tropical forests and demand for the conversion of forests to other land-uses have resulted in wildfires of unprecedented size, frequency and environmental impacts. Land managers and policy makers in many tropical countries have not been adequately prepared to cope with this increase in wildfire occurrence.

In 1991, the International Tropical Timber Organization recognised the need to develop international guidelines to assist tropical land managers in fire policy and management. This article is based on a report compiled by the authors to assist the preparation of the *ITTO Guidelines on Fire Management in Tropical Forests*.

The Issues

Today, the contribution of natural fires – such as those ignited by lightning – to the tropical wildland fire regime is considerably less important than human-caused fires. Most tropical fires are set intentionally by humans (Peters & Neuenschwander 1985; Goldammer 1990) and are related to several main causative agents:

- deforestation activities (conversion of forest to other land-uses);
- traditional, but expanding, slash-and-burn agriculture systems;
- grazing land management (fires set by graziers, mainly in savannas and open forests with distinct grass strata);
- use of fire to facilitate harvest or improve yield of plants, fruits and other forest products, predominantly in deciduous and semi-deciduous forests;
- fires escaped from settlements;
- other traditional (religious, ethnic and folk) fire uses;
- socio-economic and political conflicts over questions of property and land-use rights.

Some of these agents are discussed below in the context of different vegetation types in the tropics.

Evergreen equatorial rainforest

Fire in the equatorial rainforests is often related to forest clearing for agriculture and forest management, of which three types can be distinguished:

- shifting agriculture (slash-and-burn agriculture), where land is allowed to return to forest vegetation after a relatively short period of agricultural use;
- temporary complete removal of forest cover for preparation of forest plantations (monocultures); and
- permanent conversion of forest to grazing or crop land, as well as other non-forestry land uses.

In all cases, clearing and burning initially follow the same pattern: trees are felled at the end of the wet season and the slash is left for some time to dry out. The efficiency of the first burning is variable; it often does not exceed 10–30 per cent of the above-ground biomass due to the large fraction of forest biomass residing in tree trunks. The remainder is treated by a second fire or left to decompose.

Traditionally, shifting agriculture systems provided a sustainable base of subsistence for indigenous forest inhabitants, and their patchy effects had little impact on forest ecosystem stability. Today, shifting agriculture is practised by some 500 million people on a land area of 300–500 million hectares (Goldammer 1993a) and is often unsustainable due to the increase in size of individual plots and shorter fallow (forest recovery) periods.

The burning of primary or secondary rainforest vegetation for conversion purposes has accelerated in recent years. Such forest-clearing fires often escape and have been shown to lead to large-scale wildfires in undisturbed rainforest under the right climatic conditions. For example, it has been estimated that the total land area of Borneo (Indonesian and Malaysian provinces) affected by fires during the extreme drought of 1982–83 (associated with the El Niño-Southern Oscillation event – see box 1) exceeded 5 million hectares. A fire-damage inventory conducted by an ITTO project revealed that the main area affected by wildfires in East Kalimantan alone was about 3.2 million hectares, of which 2.7 million were tropical rainforests (see article p 10). The total economic damage of these fires has been estimated at US$9 billion (Schindele *et al.* 1989).

The susceptibility of tropical rainforest to fire can be increased by logging operations, particularly those carried out in an unnecessarily destructive or wasteful manner or which result in large gaps in the forest canopy. Such practices

Box 1:

The El Niño-Southern Oscillation

The El Niño-Southern Oscillation (ENSO) event is the most prominent known source of interannual variability in weather and climate around the world, although not all regions are affected. The Southern Oscillation component of ENSO is an atmospheric pattern that extends over most of the global tropics. It principally involves a seesaw in atmospheric mass between regions near Indonesia and a southeast Pacific Ocean region centred near Easter Island. The El Niño component of ENSO is an anomalous warming of the eastern and central tropical Pacific Ocean. In major 'warm events', warming extends over much of the tropical Pacific and becomes clearly linked to the atmospheric Southern Oscillation pattern. ENSO events occur every three to ten years and have far-reaching influences around the world. Places especially affected include the tropical central and east Pacific islands, the coast of north Peru, eastern Australia, New Zealand, Indonesia, India, and parts of eastern and southern Africa.

Source: Houghton *et al.* 1990.

can cause the accumulation of flammable biomass, invasion by weed species and desiccation of soil organic matter, all factors that make the forest susceptible to wildfire.

A series of disturbance events may also increase the susceptibility of rainforest to fire. For instance, the extended rainforest fires of 1989 in Yucatan (Mexico) which burnt about 90,000 hectares were the result of a chain of disturbances. In 1987 Hurricane Gilbert damaged and opened the closed forests, leaving behind unusual amounts of downed woody fuels. These fuels were then desiccated by the drought of 1988–89, and the whole of the forest area was finally ignited by escaped land-clearing fires. None of these three factors, the cyclonic storm, the drought, or the ignition sources, if occurring alone, would have caused a disturbance of such severity (Goldammer 1992).

Wildfires in tropical rainforests lead to high mortality because the generally thin-barked rainforest species are very susceptible to high fire temperatures, although resprouting abilities enable a few trees to recover after fire. Repeated fires lead to the invasion of fire-adapted grasses such as *Imperata* spp. (see box 2): large tracts of tropical lowlands formerly occupied by rainforest are now degraded *Imperata* grasslands maintained by short fire-return intervals.

Fire in seasonal forests

The occurrence of seasonal dry periods in the tropics increases with distance from the humid equatorial zone, leading to more open, semi-deciduous and deciduous forest formations. Such forests are often subject to frequent fires (often annual, but sometimes two or three times a year), and fire-tolerant species tend to dominate.

The main fire-related characteristics of these formations are seasonally available flammable fuels (grass-herb layer, shed leaves). The most important adaptive traits that characterise the vegetation include thick bark, the ability to heal fire scars, resprouting ability and seeds that feature fire adaptations.

Fires are set mainly by forest users such as herdspeople and collectors of non-wood forest products. The forests are underburned to remove dead plant material, to stimulate grass growth and to facilitate or improve the harvest of other forest products. The tree layer is generally not affected by the flames, although 'crowning' (where the fire enters the crowns of trees) may occur in the early dry season when the leaves are not yet shed.

Box 2:

Species Selection and Invasion

Several mechanisms allow certain plant species to tolerate fire. Thick, heat-insulating bark and deep rooting systems enable plants to survive the effects of fire temperatures that are lethal to plant tissue, while the ability to resprout after fire through 'dormant' buds (eg epicormic sprouts on tree stems and roots, and root lignotubers) allows plants to survive the partial or complete combustion of their above-ground parts. Burned land is usually recolonised by species with light seeds (thereby allowing fast and long-distance transport by wind) or through a soil seed bank.

In the tropics, annual and perennial pyrophytic grasses (Poaceae) are typically favoured by fire. *Imperata* species (*I. cylindrica* in tropical Asia and *I. brasiliensis* in tropical America) are the most aggressive fire-followers colonising fire-degraded tropical forest lands. Important perennial post-fire grass invaders (vegetative resprouters) are *Andropogon virginicus* and *Pennisetum setaceum*.

Species of the genus *Pinus* are among the most aggressive indigenous and exotic tree invaders in the tropics. Fire-disturbed sites with exposed mineral soil, especially in tropical mountainous regions, are easily colonised by pines, which release large numbers of seeds after fire. Because of their ability to cope with water stress, pines are extremely competitive against broadleaved species on exposed shallow soil sites.

There are two shrub species that are particularly aggressive fire-followers and a potential threat to exotic invasion: *Melaleuca quinquenervia*, a tree originating in Australasia, has aggressively occupied fire-disturbed sites in subtropical Florida, dominating fire-maintained communities there. This species has a high potential as a pan-tropical invader. The same applies to *Hakea sericea*, a fire-adapted shrub species also originating from Australasia and proven to be an aggressive post-fire invader in South Africa.

Based on Goldammer & Price (1996) and Cronk & Fuller (1995).

Fire-climax pine forests

Most tropical pines (*Pinus* spp.) show distinct adaptations to a fire environment (bark thickness, rooting depth, occasionally sprouting, high flammability of litter). The tropical pure pine forests of Central America and South Asia most often are the result of a long history of regular burning. As in the tropical deciduous forests, fires are mainly set by graziers, but also spread from shifting agriculture fires and the general careless use of fire in rural lands. Fire return intervals have become shorter in recent decades, often not exceeding 1–5 years, leading to the spread of pine forests outside their natural area of occurrence in a non-fire environment.

Savannas and degraded woodlands

Together with livestock grazing, fuelwood cutting and other non-wood product uses, most tropical savannas are shaped by regular human-caused fires. The impact of these fires is so dominant that it usually totally masks the non-human factors that help determine the natural range of savanna formations.

There is a tremendous variety in the physiognomy of savannas throughout the tropics, but a common feature is the grass stratum, which is an important surface fuel of the open savanna woodlands (tree savannas), the predominant or exclusive fuel of the grass savannas (grasslands), and the predominant fuel in the transition types (ecotones) between these two.

Fires in tropical planted forests

Only a minor part of the tropical industrial plantation estate is afforested with indigenous species. Most species planted are fast growing exotics, among which *Acacia*, *Pinus* and *Eucalyptus* are the genera most widely used.

Litter production in monoculture plantations of fast growing species is extremely high and not in equilibrium with decomposition. This and the exclusion of other forest uses lead to the accumulation of surface fuels (thick layers of needles or leaves, downed woody debris and shed bark strips), and aerial (draped) fuels.

Most industrial exotic forest plantations in the tropics have been established without any consideration by managers of recurrent, low-intensity fire as a means to stabilise the rate of fuel accumulation. Consequently, many of these plantations are extremely susceptible to high-intensity fires.

Most forest fire statistics from tropical countries refer to wildfires in plantation forests. For example, data from Brazil show that about 78 per cent of all reported fires between 1983 and

1987 occurred in eucalypt forests, while 18.4 per cent occurred in pine plantations and only 0.4 per cent in other species. A survey of the 1994 fire season in Brazil shows that about 20,000 hectares of forest plantations were burned.

Atmospheric Impacts

In recent years, increased attention has been given to the impact of tropical fires on regional and global-scale environmental processes, particularly the chemistry of the atmosphere. It has been estimated that the gross release of carbon into the atmosphere from tropical plant biomass burned in shifting agriculture, permanent deforestation, other forest fires and savanna fires may range between one and four billion tons per year (Andreae & Goldammer 1992).

Although emissions from tropical vegetation fires are dominated by carbon dioxide, many products of incomplete combustion that play important roles in atmospheric chemistry and climate are emitted as well. In some regions, dry season fires result in levels of atmospheric pollution that rival those of industrial centres. Photochemical reactions in the plumes of vegetation fires, for instance, may be responsible for as much as one third of the global input of ozone into the troposphere (Lelieveld *et al.* 1996). In addition, tropical fires inject trace gases and aerosols into the higher levels of the atmosphere from where they are distributed all over the globe.

'In tropical forestry, there are three basic fire management options: fire exclusion; no fire management measures at all; and integrated fire management.'

Fire Management Options

Although a major destructive force, fire has been harnessed by humans for thousands of years and performs many social and ecological functions. The task of fire management is to ensure that fire is used in such a way that its negative impacts are minimised and its positive impacts maximised. In tropical forestry, there are three basic fire management options: fire exclusion; no fire management measures at all; and integrated fire management (de Ronde *et al.* 1990; Goldammer 1993b).

Villagers combat a savanna fire in Côte d'Ivoire. Are fires a critical factor for maintaining the carrying capacity of tropical savannas for wildlife and domestic animals? Or do they lead to site degradation and loss of species? These questions must be addressed by detailed fire ecology research for each specific vegetation type and local socio-cultural and demographic situation. Photo: J.G. Goldammer.

Fire exclusion

Fire exclusion is applicable to those forest types in which any fire effect would be undesirable and counter-productive to resource management and conservation objectives. This applies particularly to the humid equatorial rainforests and may also apply to plantation-type forests that are stocked by non fire-tolerant species. Fire management requires a fire prevention and control approach and the availability of an efficient fire protection organisation.

No fire management

The option of taking no fire management measures is applicable in many of the savannas, the savanna-forest ecotones and in open deciduous forests throughout the tropics. Burning patterns (timing of burning, burning frequency) follow traditional land treatment practices or are subject to chance, driven mainly by weather patterns. The uncontrolled fire regimes of many fire climax savanna and forest landscapes may be tolerable as long as there are no additional degradation factors: in many places there may be no alternative because of the lack of active control capabilities in land management. However, the introduction of integrated fire management may increase productivity and allow progressive development from a savanna towards a forest formation.

Integrated fire management

Integrated fire management is based on a thorough understanding of the impacts of fire in a specific forest type. It requires the capacity to actively manage all fire situations, including wildfire, to use prescribed fire in order to obtain resource management goals, and to define and control the threshold between the desired and undesired effects of uncontrolled natural and human-caused fires.

Fire Prevention

The prevention of forest fires embraces a wide range of measures that either modify the fuels around or within the fire-threatened resources to reduce the spread and intensity of fires, or that reduce the human-caused ignition sources.

Fuel management

The most important fuels in forest fires that need to be treated are those between the surface and the canopy of overstorey trees. Surface fuels (grass-herb stratum, shrubs) are the main carriers of fire, while aerial fuels are those combustibles not in direct contact with the ground (foliage, lianas, twigs, understorey tree crowns) which carry the fire into the crowns ('fuel ladders').

The treatment of these fuels either concentrates on buffer zones (firebreaks or fuelbreaks) or is practised inside the forest stands themselves.

Firebreaks

The construction of firebreaks and fuelbreaks around and inside a forest is a common method employed to interrupt the continuity of fuels. A firebreak is a line up to several meters wide on which all combustibles are removed and the mineral soil exposed. The objective of firebreak construction is to segregate, stop and control the spread of a wildfire. The width of the firebreak varies with fuel loads and expected spotting behaviour (fires jumping over the firebreak). Since fires may easily cross firebreaks of up to several dozen metres, their use is not always cost-effective. In addition, firebreaks in steep terrain tend to erode during the rainy season.

Fuelbreaks

The concept of fuelbreaks is entirely different. Fuelbreaks are generally wide (20–300 m) strips of land on which the native flammable vegetation has been modified or replaced by introduced vegetation so that fires burning into them can be more readily controlled. In the tropics it has been demonstrated successfully that fuelbreaks can be maintained economically by agricultural or agroforestry land uses (eg cultivation of groundnuts, millet and legumes, as practised in Sudan). Fuelbreaks include:

- agricultural and pastoral land uses where most of the woody, above-ground biomass is removed and substituted with agricultural crops and livestock grazing;
- shaded, agroforestry-style fuelbreaks where trees are widely spaced and livestock grazing reduces the abundance of surface and aerial fuels; and
- fuelbreaks that are maintained as forest but where aerial fuels are mechanically shredded or chipped.

Fuel management inside the forest

Reducing the fuel load inside the forest can be done by mechanical means (such as pruning, thinning and removal of understorey and surface fuels); this will often be most cost-effective if the removed biomass is used by the local population. Another option is the use of low-intensity surface fires in appropriate conditions to remove fuel (prescribed burning). Extensive knowledge on the use of this technique in tropical plantations has been gained in recent years (eg in Brazil and the Philippines).

The Impact Of Climate Change

Increasing levels of greenhouse gases (such as carbon dioxide, methane and water vapour) in the atmosphere due to human activities has led to widespread speculation and research about possible global warming and climate change. General circulation models (GCMs) allow modelling of important regional and global climate parameters, which in turn allows some informed predictions as to the expected influence of climate change on tropical fire regimes. The expected effects of climate change on tropical fire regimes are as follows:

- tropical closed evergreen forests will become increasingly subject to high wildfire risk because of a combination of land-use changes (opening and fragmentation of closed forest by logging and conversion), increasing fire sources (use of fire as a land-clearing tool) and climate change (prolongation of dry seasons, increasing occurrence of extreme droughts, increase of lightning as fire source);
- the increasing prevalence of fire will coincide with species selection and ecosystem degradation bearing characteristics of species-poor, xeromorphic and pyrophytic plant communities able to cope with increasing seasonality, drought stress and fire. These plant communities are dominated by grass life forms and subjected to high risk of invasion by fire-adapted or fire-dependent species. Native broadleaved forests will be replaced increasingly by pine and eucalypt species and other drought-stress resistant species;
- tropical dry forests and savannas in regions with a predicted reduction in average total annual precipitation and prolongation of dry seasons will be subjected to higher fire risk. However, the reduction of net primary production and the increasing impacts of farming and grazing systems will lead to the formation of open and sparse vegetation cover with restricted ability to support the spread of fires;
- tropical dry forests and savannas in regions with a predicted increase in average total annual precipitation and an average reduction in dry season length will be subjected to higher fire risk due to the fact that increased net primary production will lead to the build-up of more continuous fuelbeds that may carry more frequent and larger-sized wildfires;
- there will be a phase of transition from increasing fire occurrence towards a general decrease of fires due to the lower availability of fuels for free-burning vegetation fires due to overall degradation, desertification and more intensive use of plant biomass for energy and food supply.

(based on Goldammer & Price 1996)

Participation by rural people

The majority of tropical forest fires and other wildland fires is caused by the rural population. An efficient fire prevention strategy therefore requires an understanding of the cultural, socio-economic and psychological background of the rural people. It is not surprising that surveys on fire causes often reveal that the most important reason for the careless use of fire is related to the fact that the rural population does not understand (or participate in) the economic and ecological benefits provided by forests (Goldammer 1993a). A lack of local involvement in forestry activities can give rise to rivalries and conflicts between forestry interests and agricultural land users and can provoke the intentional and careless setting of forest fires (ibid.).

Tropical forest fire management will only be successful in most cases when forest fire managers enjoy a positive relationship with the people in the rural space. Mutual confidence and public support can be created by participatory approaches and the employment of people in the forestry sector, especially in fire prevention work. The use of agriculture and grazing in the fuelbreak system, as described above, will also create a high degree of confidence and even inter-dependence (eg through a cost-free leasing of fuelbreak land).

Other measures that may stimulate cooperation in fire prevention are 'non-fire bonus incentives'. Such incentives provide funding for villages (or other types of communities) if no fire occurs on specific lands or during periods of high wildfire risk (this has been applied successfully at the 'barangay' village level in the fire-prone pine forests of the Central Cordillera of Luzon in the Philippines).

Training

Training is required at all levels. Forestry personnel – including concessionaires – require fire training at the academic, technical and forest worker level. Urban and rural fire brigades, disaster management agencies and military personnel should be drilled in wildland fire suppression techniques. Many agriculturists (both small and large scale) in the tropics have considerable empirical fire-related knowledge but generally require more training for the effective and safe use of this management tool. Such training could be provided by fire management extension services (see, for example, Heikkila *et al.* 1993), and rural stakeholders in general should be the target of education campaigns aimed at increasing knowledge on the safe and wise use of fire.

Implementing Fire Management Policy

The starting point for any nationally-coordinated approach to fire management is a national fire policy. This needs to be formulated and implemented by a well-resourced national fire management agency.

In some tropical countries, technical fire management capabilities are available in industrial plantation areas or in national parks and game reserves, but only rarely are adequate technical and infrastructural prerequisites made available for an efficient approach to fire management on a national basis.

In light of the fact that tropical forest fires have international environmental and economic implications, international and bilateral donor agencies, along with fire management organisations in developed countries, could consider cooperative efforts to help strengthen the fire management capacity of tropical countries. The draft *ITTO Guidelines on Fire Management in Tropical Forests* (see p 15) details action that could take place through bilateral and multilateral cooperation. Such efforts are essential to: 1) secure the introduction of fire management methods and technologies as developed in other countries and adapted to the requirements of tropical countries; and 2) provide the funding necessary to build up the in-country expertise and infrastructure to a point where fire management policy can be implemented effectively.

Both national and international activities will require a high degree of coordination because of the multi-sectoral approach needed. A national fire management coordinating committee could be established where appropriate to ensure effective liaison between the government, non-government and private sectors and with international agencies.

The Task Ahead

From this brief summary, it is apparent that the issue of fire in tropical forests is a complex one; tropical forest fire managers face the daunting challenge of developing an holistic understanding of the ecological and human causes and effects of fire. This is essential if they are to introduce fire management regimes that minimise the adverse effects of fire, maximise the beneficial effects, and encourage an harmonious relationship amongst the various stakeholders and between them and the land itself.

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Tropical Forest Fire in the Amazon

Fire is closely associated with forest clearing in the region

by Mauro Silva Reis

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Presently, the climate in the tropical Amazonian region is too moist to allow a forest fire to burn in undisturbed forest. There is evidence that in the remote past forest fires occurred in the region, but it is likely that even then fire was an extremely rare event, because fire intervals were many centuries in duration. For example, Saldarrioga and West (1986) determined that the ages of charcoal fragments collected from the Venezuelan part of the Amazon were 250 and 6,260 years before present, indicating that fires probably occurred in those periods.

Those fires were most likely associated with extremely dry periods or human disturbances; one reason for believing that pre-Columbian forest burning was not caused primarily by non-human agents such as lightning is the very limited extent of lightning-caused fires in the Amazon today. In addition, Uhl *et al.* (1988) found that it was not possible to burn in a tall closed canopy forest plot even after artificially excluding rain for 41 days because the high relative humidity did not permit fuels to dry to combustion point. Usually, the forest has to be felled and the trees allowed to dry on the ground for a few weeks before they can be ignited. The Amazonian fires of 1988, which brought the region to the attention of the world, were in fact slash burns for land clearing operations aimed at establishing agriculture and pasture land. Ecologically, fire is not a part of the Amazonian environment.

Thus, the vast majority of today's tropical forest fires in Latin America and the Caribbean is human-caused and takes place after the primary or secondary forest has been felled. In the last two decades, more information on the extent and damage caused by burning in these deforested areas has become available, much of it produced by satellites such as LANDSAT, AVHRR, NOAA–14, and GOES–8.

A Tool for Clearing

The use of fire to burn and clean forest land is seen by farmers and colonists as the only economically viable way of preparing the land for agriculture and is common throughout Latin America and the Caribbean. The process is illustrated by an example from the south of the Brazilian state of Amazonas along the Trans-Amazon Highway between the cities of Humaita and Aperi. Every day, four to five new families arrive in the area from the states of Rondônia, Paranà or Rio Grande do Sul. Each family receives, on average, 60 hectares of forest land under a settlement programme. Their first act is to prepare the land for agriculture and/or pasture for cattle by cutting down the forest, allowing the slash to dry on the ground for a few weeks, and then burning it.

Burning in the Amazonian region has been classified by Fearnside (1990) into categories for virgin forest, secondary forest, weeds and pasture. Virgin forest is felled prior to burning in such a way as to maximise the thoroughness of the burn. First, the *broca* or underclearing is performed, cutting those vines, understorey plants and saplings that can be cut with a machete or brush hook. The large trees are then cut in the *derrubada* (felling) phase. Most of this is done using chainsaws, although some small farmers use axes: such farmers are more likely to leave scattered trees standing in the cleared areas because of the onerous labour involved in cutting trees with axes. Large ranchers, which contract third parties to clear the forest, generally leave the fewest trees standing.

The time available during the dry season limits the area that small farmers can clear (Fearnside 1980). In order to maximise the area cleared and the quality of the burn, clearing is often done in a circular pattern, leaving an island of vegetation in the centre of the field to be felled last. The fire can then converge on the centre of the clearing to consume this last-felled area despite it still being relatively green.

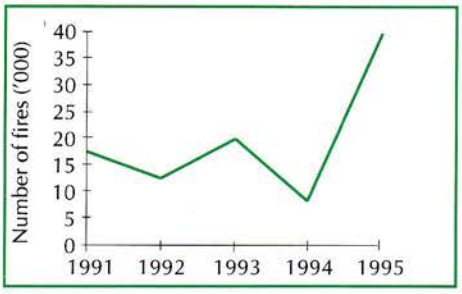
Fearnside (1989), in a study among colonists on the Trans-Amazon Highway near the city of Altamira, Brazil, reported great variability in burn quality between farmers and between years. Burn quality is a critical factor affecting soil fertility (Kauffman *et al.* 1995, for example, reported "dramatic" losses of carbon, nitrogen and sulphur and significant losses of phosphorous, potassium and calcium following slash-burning of primary tropical moist forests in the Brazilian Amazon) and agricultural productivity, and thereby plays a key role in limiting the human carrying capacity in the region.

Fires are usually set at about one pm and burn throughout the afternoon and into the night. By the next morning one can normally walk through the burned areas, although large trunks may smoulder for several days. The different species of tree burn with varying thoroughness. A few, such as samaúma (*Ceiba pentandra*) commonly burn completely to ashes.

Extent and Frequency of Burning

Satellite imagery from the AVHRR satellite interpreted by the Brazilian National Institute for Space Studies (INPE) indicated that 20.5 million hectares of Brazil's Legal Amazon (which covers an area of $5x10^8$ hectares) was burned in 1987, of which approximately eight million hectares was considered to be deforestation in the dense forest area (Seltzer *et al.* 1988).

Figure 1: The number of forest fire foci detected by the NOAA satellite in the Amazonian region of Brazil, July–September, 1991–5



Source: Anon. 1995

Figure 1 shows the number of 'foci' (separate incidents) of forest burning detected during July–September (the main fire season) in the Amazonian region of Brazil between 1991 and 1995. The number increased dramatically in 1995, apparently due to an increase in economic activity in the region (due to an overall improvement in Brazil's economic performance), leading to an increase in deforestation and associated burning. Fires vary in size from a few to hundreds of hectares. For example, in September 1995 a single farmer burned about 600 hectares of felled forest at kilometre 280 along the Trans-Amazon Highway to convert forest land to cattle pasture (Anon. 1995).

Increased Air Pollution

Slash-burning fires in the Amazon cause severe regional air pollution problems. Satellite images on 24 August 1995 showed a giant smoke cloud of about seven million square kilometres which covered all of Brazil's Amazon region and parts of Paraguay and Colombia. On the same day, the concentration of atmospheric particulate pollution in the city of Alta Floresta in the Brazilian state of Mato Grosso reached 900 milligrams per cubic metre, a level three times higher than the maximum safe level accepted by CETESB, the environmental monitoring agency in São Paulo. The airport of the city of Rio Branco, the capital of the Brazilian state of Acre, was closed 150 times in 1995 due to smoke from forest burning.

Impact on Vegetation

Repeated burning in deforested areas has a major impact on the course of secondary succession. Burning eliminates most of the stock of seeds in the soil from the original forests (Brinkmann and Vieira 1971) and can destroy regeneration from stump sprouts (Uhl 1987).

In certain parts of the tropical Latin American region, repeated burning leads to dominance of the vegetation by fire-resistant palm species such as babaçu palm (*Attalea speciosa* or *Orbignya phalerata*) and inajá palm (*Attalea regia*).

Repeated burning combined with pasture degradation through soil compaction and nutrient depletion can also contribute to deflecting ecological succession to a dysclimax of inedible grasses (such as *Imperata brasiliensis*) by impeding tree dispersal and seedling establishment. The tendency to favour grasses over trees would be reinforced by changes in precipitation patterns that are expected to accompany large-scale deforestation in the Amazon. Approximately half of the rainfall in the region is the result of water that is recycled through the forest and returned to the air via evapo-transpiration. Deforestation would reduce precipitation, particularly during the dry season (Salati *et al.* 1979; Salati and Vose 1984). Fire is likely to be an increasing threat to the remaining forest as the climate of the region becomes drier.

Logging disturbance also increases the flammability of the forest, greatly increasing the probability of slash-burning fires escaping into standing forest (Fearnside 1987). Logging activities in the Amazon region can be expected to increase in the future as stocks of Southeast Asian timber dwindle.

Fire Management

It can be said that except for protected areas (such as national parks and equivalent reserves), there is little fire management being implemented in the natural forests of Latin America and the Caribbean. Most of the conservation areas of the region have been damaged by wildfires which are usually caused by the activities of rural populations. For some of these, activities aimed at the prevention, suppression and management of fire at the boundaries and within the forest and adjacent lands are carried out.

Efforts have been made by some national governments to train officials from forestry and related agencies in fire management and protection. However, this effort is insignificant compared to the magnitude of the problem in the region.

Conclusion

Deforestation and fire go hand in hand in the tropical forest of the Amazon Basin and are occurring at an unprecedented rate. Together, they cause still largely unquantified ecological damage at the local, regional and global levels. They destroy biodiversity, cause air pollution and bring about economic losses. Land cleared by indiscriminate use of fire often quickly becomes degraded, leading to still further forest loss as farmers expand their activities to compensate for lower productivity.

Despite all this, very little has been done to implement guidelines for the protection of the region's tropical forests against fire or, on land earmarked for clearance, to find better ways to convert forest to agricultural uses. If we are to change the current trend of degradation in the Amazon, a fundamental understanding of fire and burning effects and, more importantly, of potential alternatives to the widespread use of fire is of paramount importance.

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Fire in Southeast Asia

Statistics show that fire is a significant land management issue in the region

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Despite recent major fires in the Southeast Asian region and the international concern that they have provoked, information on their extent is scanty. Forest fire statistics have been gathered on an organised basis in Peninsular Malaysia since 1975, the Philippines since 1981, Indonesia since 1982, Sabah since 1983, Thailand since 1984 and Sarawak since 1989, but their quality is often tempered by a lack of manpower for their collection, a lack of resolution by forest type, and sometimes by the dispersal of responsibility between government agencies. The data presented below originate largely from unpublished sources, and their accuracy is generally unsubstantiated.

Indonesia

Areas in Indonesia which are prone to fire include deciduous forest (particularly teak forests), forest areas whose canopies have been broken and opened, grasslands, and secondary forests. Such areas are found in almost all the 27 provinces of Indonesia. Table 1 shows the importance of fire as an agent of land use and land class change in Indonesia.

The most serious recent fire occurrence was in East Kalimantan during the period 1982–83 when a total of 3.2 million hectares of tropical rainforest in the Middle Mahakan Area was burned (Schindele *et al.* 1989). Table 2 shows the area of lowland forest burned in this period by disturbance class, demonstrating the greater vulnerability to fire of disturbed forests. In the aftermath of these fires, ITTO funded two major projects aimed at assessing the damage caused (PD 17/87 [F]) and at developing techniques for rehabilitating fire-damaged forests (PD 84/90 [F]; see *TFU* 3:5).

The 1982/83 fires were followed by another major episode in 1994, when it was reported that 161,700 hectares of forest under the purview of the Ministry of Forestry (24,900 hectares of natural forest, 107,500 hectares of reforestation and regreening areas and 29,400 hectares of forest plantations) were damaged by forest fire (Anon. 1995a). The extent of fire on land not administered by the Ministry of Forestry during that year has not been reported.

As a consequence of an international workshop on long-term integrated forest fire management held in Bandung in June 1992, a series of coordinated foreign-assisted fire management activities have been initiated. The Integrated Forest Fire Management Project, supported by the German Agency for Technical Cooperation (GTZ), has been operational in East Kalimantan since 1994 and aims to build up fire management capabilities at the provincial level. In the framework of this internationally concerted programme, FAO has provided a fire management consultant at the central administration level (Ministry of Forestry), the US Forest Service has been conducting fire management training, the European Union is supporting a fire management project in Sumatra, and other countries (Australia, Finland and Japan) are participating in other fire projects. In order to coordinate the various national agencies involved, the Government of Indonesia set up a National Coordination Team on Land and Forest Fire Management in 1995. In the same year it also banned the use of fire for large forest clearing. It is expected that these well-coordinated measures will reduce the negative environmental impacts of fire in Indonesia. Details on Indonesia's fire programmes can be found in the January 1996 issue of *International Forest Fire News*.

Malaysia

Peninsular Malaysia

The threat of fire to the forest in Peninsular Malaysia has been minimal, and most records relate to plantation forests. For example, in the period 1985–89, an area of 258 hectares was burnt in the Bukit Tarek Forest Plantation in Selangor. This represented about 0.8 per cent of the total plantation of 35,924 hectares (*Acacia mangium*, *Gmelina arborea* and *Paraserianthes falcataria*) established throughout Peninsular Malaysia.

Equatorial rainforests are highly vulnerable to drought and fire. This scene shows a lowland dipterocarp rain forest in East Kalimantan damaged by the extended wildfires occuring during the extreme dry season of 1982-83 triggered by the El Niño-Southern Oscillation event. Photo: J.G. Goldammer.

Besides the documented fire occurrences in forest plantations, it is known that fires in natural forests occur sporadically throughout the peninsula during the dry spells of January–March and June–August. Areas affected are worked-out peat swamp forests adjoining cultivated areas, secondary forests, the gelam forest on raised sand beaches in the east coast, lallang areas and rubber plantations. Such occurrences have been small in size and readily brought under control.

Sabah

Fire appears to be a more serious problem in Sabah. The worst fires of recent years occurred during 1983–1985 when it was reported that about one million hectares of (mostly logged over) forests were burnt (Phillips 1987). The cause was attributed to a severe drought which was also blamed in large part for the fires in Kalimantan during the same period (see above and also pages 3–7).

Sarawak

In Sarawak, fire incidents have been reported and documented within forest plantation areas only and to date have been relatively small in area. Data on the incidence of fire in natural forest in Sarawak are not available.

Philippines

Table 3 shows the area of forest burned in the Philippines in recent years. These data are probably an underestimate, since most forest fires in remote areas are not reported. Fire occurrences sometimes escape detection due to a lack of transport, manpower and accessibility. Of the area reported burned in 1992, 5,064 hectares was natural forest, 31,842 hectares was plantation, and 14,404 hectares was grassland. In 1993, 312 hectares was natural forest, 14,603 hectares was plantation and 415 hectares was grassland.

A major forest fire problem exists in the mountainous pine forests of the Central Cordillera (Luzon). The native pine (*Pinus kesiya*) is quite resistant to surface fires whereas the broadleaved dipterocarps are eliminated by fire. This leads to the formation of fire-climax pine forests. Increasing use of fire, however, and the rapid spread of an introduced bark beetle (*Ips calligraphus*) are now leading to more severe damage, notably erosion and destruction of plantations and natural forest regeneration. In the mid 1980s, FAO supported fire management, research and training in this critical mountain area (FAO 1985, 1987).

Table 1: Average annual rate of land-class change and its causes in Indonesia, 1982–1990

Nature and/or factors influencing land-use/land class changes	Average area (hectares/yr)	%
Development of estate crops such as rubber and oil palm	160,000	12.2
Transmigration and related infrastructure	300,000	22.8
Shifting cultivation	300,000	22.8
Forest fire (normal)*	100,000	7.6
Influence of the East Kalimantan fires of 1982/83 on the average for 1982–90	378,000	28.7
Other reasons (such as spontaneous transmigration, illegal logging, mining, urban development, etc)	77,000	5.9
Total	**1,315,000**	**100**

Source: Anon 1995b.
*'Normal' refers to all fires except the East Kalimantan fires of 1982/83

Table 2: Area of forest burned in East Kalimantan during the 1982/83 fires, by disturbance class

Disturbance class	Area ('000 hectares)	Percentage of total mapped area	Percentage burnt	Percentage unburnt
undisturbed forests	410	9	11	89
lightly disturbed forests	1,096	23	58	42
Moderately disturbed forests	984	21	84	16
Heavily disturbed forests	727	15	88	12
Plantations	27	1	96*	4
Total lowland forest burnt	**3,244**	**69**	**67**	**33**

Adapted from Schindele *et al.* 1989.
**Note: this does not mean that 96 per cent of plantations were burnt, but that 96 per cent of the area covered by plantations in 1988 were burnt areas in 1983.*

Thailand

The forests of Thailand are categorised into two main groups: evergreen forest (45%) and deciduous forest (55%). The deciduous forests are further classified into three main subgroups: mixed deciduous forest, dry dipterocarp forest and savanna. Since they shed their leaves during the dry season of December to April, creating high fuel loads, these forests are extremely vulnerable to fire, although the statistics available do not distinguish between forest types. Table 4 shows estimated area of forest burnt in the years 1985, 1986, 1992 and 1993.

The Royal Forest Department of Thailand has had some success in reducing wildfires through public fire prevention campaigns and the strengthening of local fire management brigades. Thailand is the first Southeast Asian country in which helicopters and fixed-wing aircraft have been used for aerial fire fighting and personnel transport on a regular basis.

Table 3: Forests burned in the Philippines, 1978–93

Year	Burned area (hectares)	Year	Burned area (hectares)
1978	25,233	1986	4,257
1979	18,136	1987	5,386
1980	18,324	1988	423
1981	12,471	1989	4,683
1982	8,063	1990	12,473
1983	117,951	1991	5,872
1984	3,177	1992	51,310
1985	11,743	1993	15,330

Source: Bartolazo 1994.

Table 4: Estimated area burnt by forest fires in Thailand, by year

Year	Total forested area (million ha)	Estimated area burned (million ha)	Portion of total forest area (%)
1985	14.9	3.5	24
1986	14.9	3.8	25
1992	13.7	1.9	14
1993	13.7	1.5	11

Source: Anon. undated.

Vietnam

The main fire problem areas in Vietnam are as follows: regularly occurring fires in seasonally flammable deciduous forests; wildfires in indigenous pine forests; wildfires in other natural and degraded vegetation; the shifting agriculture and deforestation complex; and use of fire in intensively treated agricultural lands. The peak of burning activities in Vietnam is during the mid to late dry season (January–April).

Statistical information is only available for the mountainous pine forests in the highlands of Da Lat (northeast of Ho Chi Minh City). The annual area reported destroyed there by fire usually does not exceed 100 hectares, but many fires seem to be unreported. One major problem is fire occurring in the economically very valuable *Melaleuca leucadendron* forests (see Goldammer 1992 for details).

Fire protection measures, such as these being carried out on reforestation lands of central Myanmar, provide labour and income for the rural population and may create mutual confidence and collaboration with land management authorities. Cooperation at the local, regional and international levels will increase capacity to control the effects of fire, in the Southeast Asian region and elsewhere. Photo: J.G. Goldammer

The Need for Regional Cooperation

These data, while imperfect, suggest that fire is a significant element of land use throughout the Southeast Asian region. Its causes are complex but are related to forest conversion, forest damage by logging, disputes over land use and the widespread use of fire by farmers (see article pages 3–7 this issue).

The effects of fire go beyond national boundaries. For example, the haze which shrouded central and southern parts of Peninsular Malaysia and Singapore towards the end of 1994 was attributed to the burning of agricultural conversion forests in northern Sumatra and Kalimantan. Other effects of fire, such as those on wildlife, vegetation, the livelihood of local people, forest sustainability and forest industry are of local, national and international concern, and the financial costs of such fires are considerable. It has been estimated that the average annual loss due to fire in Thailand is US$800 million (Anon. undated).

The magnitude of the problem and its international ramifications suggest a strong need for regional cooperation in fire management, prevention and suppression, and also in the collection and dissemination of accurate information on the extent, causes and cures of fires on tropical forest lands. In 1993, a bilateral committee between Malaysia and Indonesia, which considers all relevant forestry-related matters and acts to exchange information and experience, established a working group to consider fire-related concerns. This working group is engaged in the development of an action plan involving the acquisition of equipment and cooperation in training. We suggest that the idea of international cooperation in fire management could be broadened to include all interested nations in the region. Provided with the necessary resources, such a regional body could be a useful mechanism for strengthening fire management capabilities in Southeast Asia.

The Association of South East Asian Nations (ASEAN) has taken the first steps towards discussing fire-related environmental problems (transboundary haze pollution) at a regional level. The present plans of the ASEAN Institute for Forest Management (AIFM) to establish an ASEAN-wide regional fire management programme merit full support.

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Forest Fire in Tropical West Africa

Fire in the rural landscape eats into the dense forests of the region

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The use of fire will always be controversial, since it renders both good and bad services, and the definitions of 'good' and 'bad' may often be ones of perspective. Nor is forest destruction by fire unique to Africa or even the tropics. To cite only one example among many, the maritime pine forests of the Landes, France are often the scene of serious fires, sometimes causing considerable losses in property and human lives.

Nevertheless, the situation in the tropical forests of Africa is particularly serious because of the existence of conditions which favour the phenomenon. Among such conditions are:

- the tropical African climate with its prolonged dry season;
- the predominant natural herbaceous vegetation which is always ready to burn;
- people's traditional (and perhaps unchangeable) attitude towards fire; and
- the high degree of poverty which affects the population and their governments, generally resulting in a lack of efficient means of extinguishing, avoiding or combating such fires.

The fire season in the West African savanna regions starts in early December and ends in early July of the following year. But since 1982/83, which was a remarkable season of devastating fires (due partly to drought induced by the El Niño–Southern Oscillation event – see p 3), fires have become increasingly important in the penetration of the humid evergreen forests.

Traditional Use of Fire

Humans are responsible for nearly all fire starts in West Africa. Many of the reasons for fire ignition are cultural and political, and not easily amenable to change. During wars and fierce battles, for example, the innocent forests are considered an obstacle preventing access to the enemy, and fire an efficient weapon for eliminating him. In order to flush out or destroy the enemy, soldiers, marquis and other mercenaries set fire to the savanna and other forms of forest mercilessly.

In all countries, fires are lit by villagers to assist in the hunting of rodents and other game and the gathering of sticks for firewood, to keep off snakes and vermin, or simply to remove vegetation which obstructs sight. Such practices are made worse where there is little traditional respect for the tree in tribal lore.

Forest-Savanna Transition Zone Most Vulnerable

Penetration of fires into Cameroon's high forest was observed during the long dry season of 1982/83. In 1990, the work of de la Metterie (1990) showed that fire penetration by agriculture through burning is aggravated by two factors largely out of the hands of foresters, namely:

- increasing population density; and
- the reduction in the bush-fallow period.

Based on the situation in 1984 in three divisions, de la Metterie made 'optimistic' and 'pessimistic' forest cover projections for the year 2004, assuming a doubling of population in that time (Table 1).

These projections show that deforestation is most serious in Mefou, which is situated in the forest-savanna zone where fire is a particularly important factor. Data for Côte d'Ivoire confirm the suggestion that it is the forest-savanna transition zone which is most vulnerable to fire. Of the 11,967 hectares of plantation reported destroyed by fire between 1981 and 1994, 10,808 hectares (90 per cent) were located in the Tene and Sangoue regions in the forest-savanna zone, which is dominated by savanna and bush fallow with a predominance of slash-and-burn agriculture (Société de Développement des Forêts [SODEFOR] pers. comm.).

All the West African countries are seriously affected by fire but, unfortunately, no country has a complete record of damage caused. Cameroon reported 1,600 hectares of planted forests burnt in the period 1988–93, although this estimate does not include fires south of the humid savanna zone (Dir. Foréts pers. comm.). Togo reported 1,386 hectares of teak, *Eucalyptus*, *Acacia* and *Dalbergia* plantations burned in 1995 (Office de Développement et d'Exploitation des Forêts, pers. comm.).

Only Côte d'Ivoire made a thorough investigation of the zones affected by fire in 1982/83 (Table 2). Of 18.1 million hectares surveyed in that country, it was estimated that 1.7 million hectares was burnt. Of this, 45,000 hectares was forest reserve, while considerable areas of valuable crops were also affected. Twenty-one people were killed (SODEFOR pers. comm.).

Table 1: Projected forest cover (per cent of total land area) in three divisions of Cameroon

Year	Division		
	Mefou	Nyong et soo	Ntem
1984	40.3	46.2	66.4
2004 (pessimistic)	5.8	18	57.8
2004 (optimistic)	35.7	36.7	64.4

Source: de la Metterie 1990, p89.

Table 2: Summary of areas affected by fire during the dry season of 1982/83 within the coffee and cocoa regions, Côte d'Ivoire[1]

	Area (hectares)
Total area covered by investigation	18.1 million
Area burnt	1.7 million
Forest reserves destroyed[2]	44,976
Coffee plantations destroyed	38,888
Cocoa plantations destroyed	59,880
Other plantations destroyed	6,796
Food crops damaged	3,780
People killed	21

[1] excludes Bongouanou Division, for which useful information was not obtained

[2] includes national parks. Source: SODEFOR (pers. comm.)

Strategies and Policies

Without reservation it can be said that, at a regional level, there is a complete absence of strategies or policies against bushfires and forest fires in West Africa. There are no seminars, no discussions, no special funds to be mobilised against fires, nothing really concrete against a phenomenon that carries on quietly until hitting the headlines in extreme events such as those that occurred in 1982/83. The only measures common to most West African states since the colonial era are traditional fire-traces (which are roads at least 30 metres wide traced manually or mechanically around a protected forest designed to prevent fires from entering the forest from outside) and other wildfire-preventative measures like early burning.

In Côte d'Ivoire, whose case we continue to cite because of its relatively high awareness of the dangers of fire, the SODEFOR programme for 1995/96 consists of the construction and upkeep of roads and fire-traces, increasing from 2,198 km in 1994/95 to 4,325 km in the current period. From June 1986, by decree No. 86–378, the Ivoirian government created a National Committee for Forest Defence and Bushfire Control, consisting of 18 members and provided with a permanent secretariat. The committee has the following six roles:

- to propose to government the appropriate measures to adopt and to make recommendations to prevent deforestation and destruction of wildlife;
- to put in place an efficient strategy against bushfires and burning of forest and to look for the means to apply such a strategy;
- to assist technical ministries and private and public organisations in the application of measures proposed by the committee and approved by government;
- to propose and provide the means for educating, informing and sensitising the rural and urban populations, including youths, school children and non-scholars on the need to protect the Ivoirian forest and its wildlife and to avoid bushfires and forest burning;
- to study measures aimed at discouraging or dealing with bushfires and to put pressure on violators of bushfire regulations;
- to coordinate and direct efforts undertaken by the committee related to the committee's objectives.

Recent Publications on Fire in West Africa

In the last issue of *International Forest Fire News* (No.14, January 1996) two contributions deal with fire in West Africa. Materials which the General Secretary of the National Committee for Forest Defence and Bushfire Control, Côte d'Ivoire, had presented to the ITTO Expert Panel for preparation of the fire guidelines reveal the severity of the fire problem in his country and the need to further improve fire management capabilities. Racine Kane from the Bushfire Monitoring Unit of the Centre de Suvi Ecologique, Dakar, reports on the use of remote sensing data to monitor bushfires. The evaluation of the 1993/94 images reveals that approximately 750,000 hectares of savannas were burned in that fire season.

Meanwhile the findings of the international fire research programme in West Africa, the FOS/DECAFE-91 Experiment (FOS/DECAFE=Fire Of Savannas/Dynamique et Chimie Atmosphérique en Forêt Equatoriale), have been published (Special Issue of the *Journal of Atmospheric Chemistry*, Vol. 22, Nos. 1 and 2, October 1995). The results of the research shows that the characteristics of the regional atmosphere are highly influenced by savanna fires. One of the main phenomena observed was the formation of high amounts of ozone in the lower troposphere.

Côte d'Ivoire has thus determined to take a firm stand and is seeking a lasting solution to the problems caused by fires.

Where Should Efforts be Concentrated?

The author believes that, ultimately, flora and fauna will be conserved effectively in tropical Africa only within forest reserves. Under the present conditions of misery and poverty in some countries, it is no good dispersing the few means available for biodiversity conservation over the entire rural landscape. Nobody can completely prevent people from setting fires or from eating bush meat. In the face of human pressures and largely in the absence of well-funded preventative measures, natural resources outside protected areas are destined to disappear sooner or later. Therefore, more forest reserves should be created and we should concentrate our efforts aimed at reducing the deleterious effects of fire and other threats in and at the periphery of such areas.

Cameroon, for example, has commenced a programme to improve the protection and management of its natural forests. With Canadian technical assistance, a land-use plan of all lands covered by forests in the southern part of the country (14 million hectares) has been under study for the past ten years. This plan, which includes the setting aside of 8.9 million hectares of permanent forest reserves (about 60 per cent of Cameroon's tropical forests) is now being applied through decree No. 95/678/PM of 18 December 1995.

Although indirect, this strategy, when implemented, shouild help to safeguard the permanent forest estate from inroads caused by agricultural burning. It is advisable that all the services concerned (not only the traditional forestry services) should collaborate directly towards the application of this decree by starting with boundary demarcation and supervision in the field in order to attract the necessary funds for management operations. Forest managers should be aware, however, that fire prevention and control in the periphery of these reserves will be essential for their long-term survival.

Reference

de la Metterie, D. 1990. *L'organisation de l'interface Agriculture–Forêt en zone de forêt dense.* Projet MAKAK, Cameroun. 188 pp.

Fire Ecology Information Exchange Sought

The Fire Ecology Unit of the Ghana Forestry Department would like to exchange ideas and information with groups carrying out research in such fields as: the influence of fire on semi-deciduous forest dynamics; the effects of experimental fires on degraded and undegraded forest; bark characteristics of tree species in relation to fire sensitivity; forest fire prevention and control (including measures to prevent or reduce the risk of fire such as the development of an early warning system, firebreak trials and public education). Please contact: Dr T.K. Orgle, Head, Fire Ecology Unit – Planning Branch, Forestry Department, PO Box 1457, Kumasi, Ghana; Ph 233–51–23366; Fax 233–51–22687.

ITTO's Guidelines on Tropical Forest Fire Management

These draft guidelines cover the entire spectrum of social, economic and environmental factors related to tropical forest fire

In 1991, the International Tropical Timber Council (ITTC) agreed to establish an expert panel to produce a draft set of guidelines for the protection of tropical forests against fire. This set was to complement existing ITTO best-practice guidelines on other aspects of sustainable natural and planted tropical forest management.

The expert panel duly met in Jakarta, Indonesia from 6–10 March 1995. It considered a background paper prepared by Dr Johann G. Goldammer (Germany) and Mr Syafii Manan (Indonesia) and formulated a draft set of guidelines, which it recommended be named the *ITTO Guidelines on Fire Management in Tropical Forests*. The draft guidelines will be considered for possible adoption by the ITTC at its 20th Session in May this year.

The draft *Guidelines* are structured in a similar manner to others produced by ITTO in the past. Under various categories, principles are stated, and actions are recommended to ensure that the principle is upheld. Below are examples taken from a total of 45 principles and recommended actions.

Policy development

Principle #5: a fire management plan is an essential component for the prevention, suppression and management of fire within forests and adjacent lands. Fire management plans must be part of an overall land-use (eg forestry) management plan. Planning should be on a cooperative basis on national, provincial and local levels as appropriate.

Recommended action #5:

- provide adequate resources for fire management planning at different levels;
- develop fire management plans which include a clear statement of objectives and incorporate information on land tenure, assets threatened, degree of fire risk, fire history and fire management measures;
- promote the active participation of concession holders, local communities and all other voluntary organisations, particularly non-governmental and women's groups. Their participation needs to be based on their abilities which could be enhanced through training on fire management, and providing appropriate equipment and incentives whenever feasible.

Community participation

Principle #10: The majority of tropical forest fires and other wildland fires are caused by the activities of the rural population. An efficient fire prevention strategy therefore requires an initial understanding of the cultural and socio-economic background of the tropical fire scene. The fire prevention programme relies heavily on a positive relationship between the rural community and the forest-fire manager. Mutual confidence and public support can be created by participatory approaches.

Recommended action #10:

- employ or encourage participation of rural residents in fire prevention work such as establishment and maintenance of fire breaks and other fuel treatments;.
- encourage integration of agriculture and grazing land use into fuel break systems through incentive mechanisms (eg through cost-free leasing of fuel break lands);
- stimulate community cooperation in fire prevention through various incentive measures such as provision of funding for villages which have succeeded in preventing wildfires spreading into adjoining forest lands.

Capacity development

Principle #15: in many producer countries the expertise and hardware required to build up a national fire management system are inadequate or not available. Assistance through bilateral and international programmes therefore should be offered by consumer countries and international organisations in order to enable the transfer of existing knowledge and advanced technologies.

Recommended action #15:

- nations and organisations with expertise should offer advice in building institutional frameworks and capacities in fire management.

Socio-economic considerations

Principle #23: there may be competing or conflicting land resource uses between rural inhabitants and other land use classifications such as forest concessions and conservation units. These conflicts can lead to the setting of wildfires. People need to be able to benefit directly from forest uses in order to value and protect these resources.

Recommended action #23: provisions should be made for consultations with local communities in an open and transparent way to resolve conflicts on rights of forest land use and the obligation of fire protection.

Forest resources management

Principle #34: logging operations may result in accumulation of biomass, invasion by weed species and desiccation of soil organic matter which increase fire risks.

Recommended action #34:

- plan logging operations to avoid creating large openings which result in the drying of the forest floor and invasion of fire prone pioneer species, and allow for techniques (such as climber cutting) to minimise damage to surrounding trees;
- logging wastes should be minimised through a system of incentives and penalties that apply to concession holders. Where appropriate, encourage the use of logging residues by local communities, so long as this activity does not increase the risk of fire starts.

Public education

Principle #45: the public's understanding of and attitudes towards the role and use of fire and forest management practices can best be improved through the education of children and youth. They must be given education at primary and secondary school levels on environmental issues, forest and natural resource management, and the impacts of wildfires.

Recommended action #45: establish or enhance cooperation between forest authorities and education departments to allow for the design of suitable curricula and the conduct of education programmes for elementary and secondary schools on forest and fire management.

If these guidelines are adopted by the ITTC in May, it is hoped they will be available for public distribution in the second half of this year. A notice to that affect will be posted in the appropriate edition of the *TFU*. ■

Ongoing International Activities in Wildland Fire

A synopsis of current international research and collaboration

compiled by Johann G. Goldammer*

The United Nations (UN) provided the first ongoing efforts in international cooperation between wildland fire scientists, managers and policy makers when the Timber Section of the UN-ECE Trade Division in Geneva became active within the ECE region (North America, Europe and the former Soviet Union). With the support of the FAO/ECE/ILO Team of Specialists on Forest Fire, the Timber Section organised a number of seminars, the latest of which is scheduled for later this year (see box).

International Forest Fire News (IFFN) is the official carrier of information for this cooperative effort and is shared with all interested non-ECE countries. The UN system has also formed a special fire group within the FAO Committee on Mediterranean Forestry Questions (Silva Mediterranea). The FAO Forestry Department conducts ongoing field projects in fire management throughout the tropics and publishes *Global Wildland Fire Statistics*.

Contact for UN-FAO/ECE activities on fire is: Dr J.G. Goldammer, at the address below.

The International Association of Wildland Fire (IAWF)

The international community of fire scientists started to organise itself in the early 1990s. After launching the first scientific periodical, *Journal of Wildland Fire*, the Fire Research Institute (USA) was transformed into the International Association of Wildland Fire in 1992. The major aim of this association is to provide the latest information on wildland fire issues through the journal as well as through *Wildfire* (a quarterly magazine), *Current Titles in Wildland Fire* (a monthly bulletin available on disk or printed that lists new articles, videos and books on wildland fire), and a continuously updated *International Directory of Wildland Fire* (master list of 30,000 people working in that field), and an *International Bibliography of Wildland Fire* (with more than 45,000 citations on wildland fire).

For more information, contact: International Association of Wildland Fire, 103 E. Main, P.O. Box 328, USA-Fairfield, WA 99012, USA; Fax 1–509–283 2264.

Electronic Networks

Quick information and a communication platform is provided by FireNet, an electronic network on the Internet. Entry points to FireNet's first node are: <listserver@life.anu.edu.au> and http://life.anu.edu.au/landscape_ecology/firenet/firenet.html

Seminar Announcement

4–10 August 1996. **FAO/ECE/ILO Seminar on Forest, Fire, and Global Change**. Shushenskoye, Krasnoyarsk Region. Host of the seminar will be the Government of the Russian Federation through its Ministry of Forestry. The seminar's objective is to promote understanding of the role of natural vs accidental fire in global ecosystems, with special emphasis on the ECE region.

The expected outputs of the conference, in partial fulfilment of the UNCED process and the International Decade for Natural Disaster Reduction, will be international agreements to: develop a standardised fire inventory system; establish mechanisms to collect and evaluate fire inventory data on a global scale; develop an internationally accepted statement on fire management policy; and establish mechanisms for international cooperation in fire management on a regular basis and in disaster management assistance.

An exhibition and meeting of fire management specialists and equipment producers will be organised in tandem with the seminar.

Contact: In Russia: Mr D. Odintsov, Deputy Chief, Federal Forest Service of Russia, Moscow, Russia; Fax: 7–095–233 0950. In Germany/UN: Dr J.G. Goldammer, at the address below.

Scientific Programmes

The International Geosphere-Biosphere Programme (IGBP) provides the basis for interdisciplinary fire research programs. One of the operational IGBP core projects is the International Global Atmospheric Chemistry (IGAC) Project, which is investigating the impact of biomass burning on the atmosphere and biosphere ('Biomass burning experiment' – BIBEX). Since 1990, several major interdisciplinary international research campaigns have been conducted or are in the planning and implementation stage, the most important of which in the tropics are the Southern Tropical Atlantic Regional Experiment (STARE) and The South East Asian Fire Experiment (SEAFIRE).

STARE was designed to investigate the atmospheric chemical consequences of fires in tropical and subtropical forests and savannas of South America (Brazil) and Southern Africa. This first intercontinental fire experiment was conducted in the field during 1992 and involved more than 150 fire researchers from 14 nations. It demonstrated that fires on both sides of the tropical Atlantic cause elevated ozone concentrations in the troposphere during the dry season (August–November). The Southern African Fire-Atmosphere Research Initiative (SAFARI) was the African part of STARE and included major fire ecology research components at a subcontinental level. In 1996–97, additional international fire research programmes will be conducted in near-equator Africa, particularly in the Central African Republic, Congo, Zambia, Tanzania and Kenya.

SEAFIRE is in the planning stage and will take place in the late 1990s. It will investigate the characteristics and regional and global transport of emissions from various types of fire in tropical Southeast Asia, such as fires used in forest conversion and shifting cultivation and in grassland and seasonally dry forests (monsoon forests).

For more information, contact: BIBEX Secretariat, c/- Dr J. G. Goldammer at the address below.

*Dr Goldammer is leader of the Fire Ecology and Biomass Burning Research Group at the Max Planck Institute for Chemistry. Besides conducting research on ecological and atmospheric chemical impacts of vegetation fires in the tropical and boreal zones, the group coordinates regional fire research campaigns with the involvement of international and interdisciplinary participation. The research group is cooperating with many partner countries to compile data in the framework of the Global Vegetation Fire Inventory.
Dr Goldammer is also leader of the FAO/Economic Commission for Europe (ECE) Team of Specialists on Forest Fire. This group is working on an honorary basis for the Timber Section, UN-ECE Trade Division, and consists of representatives of ECE member states.

Dr Goldammer's address is: Fire Ecology Research Group, Max Planck Institute for Chemistry, Biogeochemistry Department, c/o University of Freiburg D–79085, Freiburg, Germany; Fax 49–761–808012.

Financing an International Organisation (Part 2)

What happens to money pledged by donors to ITTO's Special Account

by Lachlan Hunter

Assistant Director, Management Services, ITTO, Yokohama

The first article in this series (*TFU* 5:4, December 1995) described the structure and operation of ITTO's Administrative Account. This, the second and final article, introduces ITTO's Special Account, the function of which is to accept voluntary contributions from aid donors, and to furnish these funds to projects, pre-projects, and other Council-approved activities for their implementation. Although ITTO has other responsibilities under its founding treaty, the ITTA, 1983, it is the project programme which gives the Organization a real presence in the tropical forestry sectors of developing countries

The Project Programme

The simplest definition of an aid project is: 'a planned and integrated set of activities designed to improve the welfare of a country through achievement of a specific sectoral objective and wholly or partially funded by an external multilateral or bilateral source'.

A pre-project is: 'a set of activities designed *to identify and formulate* a project and usually wholly funded by an external multilateral or bilateral source'. Other aid agencies may use terms such as 'feasibility study' for pre-projects, but the principle is similar.

The International Tropical Timber Council (ITTC) itself also directly initiates activities. These comprise various missions, workshops, expert meetings, consultancies, research studies, and publication of technical documents and policy development guidelines which collectively bear the title 'Activities'.

Unfortunately, all aid projects are chasing scarce resources, and those approved by the ITTC are no exception. Moreover, as ITTC funds are grants, not loans, forestry sectors of the developing world with existing debt burdens have a natural tendency to increase the demand for such resources. ITTO may sponsor projects for loans by other institutions, but to date no sponsored project has been undertaken.

The Project Cycle

ITTO's project cycle has evolved with continuous amendments and additions over the years and is constantly the subject of studies to further improve its efficiency. Indeed, analysis now underway will lay more recommendations before Council at the forthcoming Twentieth Session in May 1996.

Proposals usually emerge within a (generally developing) country and are formulated frequently by government agencies but often also by independent institutes or NGOs, although all proposals must be submitted to ITTO through an official government channel. ITTO has published a Project Formulation Manual whose project format and instructions must be followed, including use of transparent budget item headings. Submitted proposals are then reviewed by the Panel of Experts for Technical Appraisal, which analyses the relevance of the project to ITTO's objectives, their technical soundness and the appropriateness of the budget to the work proposed. The Panel may require reformulation or the inclusion of additional information before recommending that the proposal be referred to the ITTC at its next Session, where it will be discussed by the relevant Permanent Committee of the ITTC and a decision made on whether or not it merits approval. Once approved, donors are invited to provide finance for its implementation at the Chairman's Informal Consultative Group on Project Financing, which takes place on the penultimate evening of the Council Session. Projects not immediately financed may receive funding at any of the next three Council Sessions, after which they are sunset (ie lose their approved status; see figures 1&2).

Who Finances?

Most ITTO project financing is from sovereign donors. The list is short, and displays a very skewed distribution, with one large regular donor (Japan), a few medium-sized regular contributors, and some intermittent smaller ones. The ITTA, 1983 allows for multilateral financial organisations to make contributions to ITTO's Special Account, but none have ever done so. Some trade organisations and private companies also make significant regular donations, and the list includes some non-profit service groups. About 80 per cent of projects and pre-projects now have multiple donors.

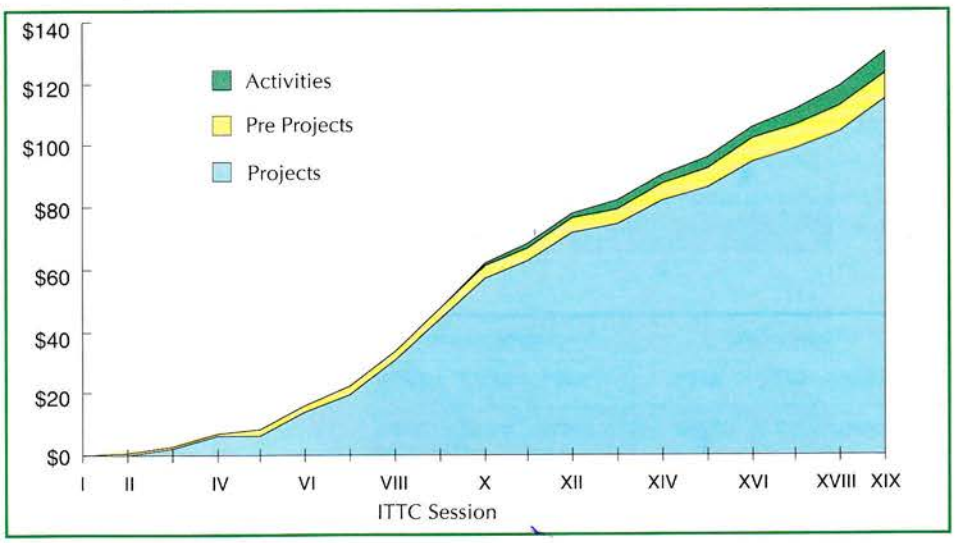
Few Member country delegates attend ITTC Sessions with full authority to commit their country to funding a particular project. Written agreement from financial authorities in the donor country capitals may take some time after the Session, and ITTO must comply with any procedures required of it by such donors, which in the case of large single donations may involve another written contract with additional conditions.

Council's decision to approve a project or pre-project fixes the project document and thereby the budget too (although the exception to this is an arrangement with the Common Fund for Commodities in co-financed projects, of which there are currently four).

Disbursement of Funds

Following approval and financing, the Secretariat and the Executing Agency (EA) immediately draft, respectively, the Project Agreement and the Workplan, the latter of which must have a schedule of activities which corresponds accurately with the budget timetable. The disbursement of funds is usually divided

Figure 1: Voluntary contributions to the Special Account, 1987–95 (cumulative; US$ million – accrual basis)



into tranches, each relating to the expected expenditure in a particular period, generally six months or one year depending on project length and type. Specific conditions, with which the Executing Agency must comply, attach to the disbursement of each tranche.

The Executive Director of ITTO is the last party to sign a Project Agreement and will not do so until he is assured of full financing in the Special Account: ITTO's Financial Rules do not allow the project to commence until this condition is satisfied. Such caution is necessary to protect ITTO against the risk of donor default, even though this is extremely rare. As a rule, the host government also makes a counterpart contribution, frequently in kind through the services of staff and existing facilities, and committed when the government first submits the project proposal.

The first tranche is normally released after full signature and notification from the EA that the project is about to begin (project funds are not permitted to sit idle in the accounts of agencies pending use). Later tranches usually require satisfactory progress reports to trigger release. In the case of projects with budgets exceeding US$400,000 and durations of over two years, tranche release also requires the recommendation of the Steering Committee, a mandatory body for such larger projects composed of representatives of ITTO, EA, donors (at the option and expense of the donor) and, often, local community organisations.

The formal request is made to the Executive Director and, after checking compliance with disbursement conditions by the technical division and the Secretariat's administrative arm – Management Services – the funds are released to the EA. Even then, as the proverb says, 'there's many a slip 'twixt cup and lip', and mishaps include incorrectly transcribed bank account numbers, specification of inappropriate correspondent banks and even recipient banks being placed into receivership! To minimise these risks, the Secretariat triple checks transmission details and EAs are recommended to follow similar procedures.

Funds Retained by ITTO

ITTO retains project funds for the following purposes:

- an amount for contingencies;
- an amount to support visits by Secretariat technical staff or consultants to the project site for Steering Committee meetings or general monitoring and review;
- a sum of 5.5 per cent of the basic project budget for ITTO's Programme Support Fund. In the case of projects directly executed by the ITTO Secretariat, this becomes 10.5 per cent but monitoring and evaluation must be covered by this amount as well. The Programme Support Fund, which commenced in financial year 1992, has been an important means of supplementing the Administrative Budget's limited provision for staffing;
- the cost of the pre-project, where one has given rise to the project, for reimbursement to the Pre-Project Sub-Account.

Auditing

Periodic financial reports and a final audit are required. Both documents should display expenditures under the same headings used in the Project Formulation Manual and the Project Document. Accounts may be inspected at any time by any competent person authorised by the Executive Director of ITTO to do so. The EA must make provision for the audit fee. Unspent funds, including any bank interest earned, should be returned to ITTO for pro rata distribution to the original co-financiers. Post-completion evaluation missions occur where a successor project is proposed.

Conclusion

ITTO is an important, albeit modest, grant aid contributor to the world forestry sector with overall emphasis on promoting transparent free trade and sustainable management practices in the wet tropics. Although the average scale and duration of projects is small relative to those carried out, for example, with loans from international development banks, the grant facility continues to attract. Since 1992, larger projects have often been phased to offer feasible financing schedules to donors, although with some risk of no funding for later phases, should the economic barometer fall.

The ITTA, 1994 (expected to come into force shortly) will establish the Bali Partnership Fund, a new account dedicated to funding projects designed to help producer member countries achieve ITTO's Year 2000 Objective. Some US$11.5 million has already been committed by Japan to this fund, which will have the supplementary capability of growing through part of the income earned by the general Special Account. Nevertheless, the most formidable problem still facing the Organization is the limited total number of donors and the small fraction willing to play in the top league.

Relevant ITTO Documents

International Tropical Timber Agreement, 1983 & 1994.

Financial Rules and Rules Relating to Projects of the ITTO, 1987. GI–3.

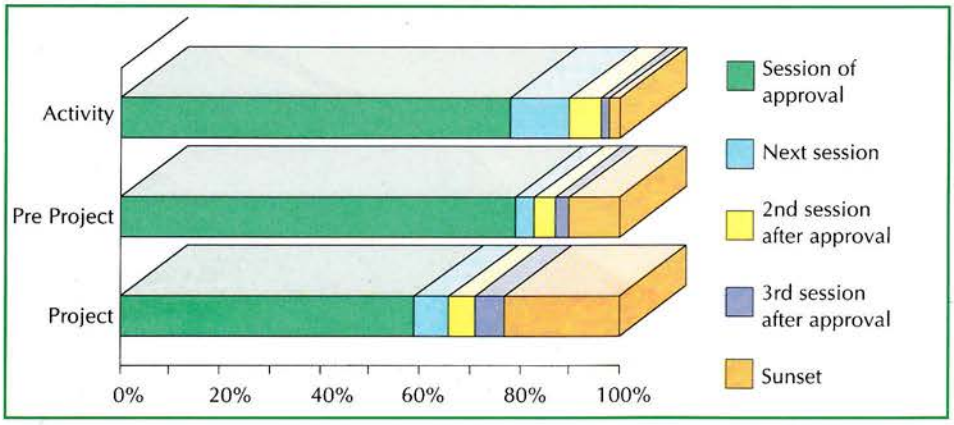
ITTO Manual for Project Formulation, 1992. GI–4.

ITTO Manual for Project Monitoring, Review and Evaluation, 1992. GI–5.

Guidelines for the Selection and Employment of Consultants and Guidelines for the Procurement and Payment of Goods and Services Financed from the Special Account, 1993. GI–9.

This article has sought to describe the operations of the Special Account as objectively as possible, but any views expressed are the author's own and not the Organization's. ■

Figure 2: Average propensity (per cent) for an approved project to be fully financed



Erratum

The graph on page 17 of *TFU* 5:4 (December 1995) showed the average annual staff complement funded by the administrative budget to be that portion of the graph between the blue and green colours. In fact, the line showing the administrative budget component should be read independently of the 'other sources' line (and colour), and it is the sum of these two components which gives the total average annual staff complement.

Timber Trends

Trade Pages

Introducing ITTO's new Market Information Service

by Michael Adams

Market Information Service Coordinator, ITTO Secretariat, International Organizations Center – 5th Floor, Pacifico-Yokohama, 1–1–1, Minato-Mirai, Nishi-ku, Yokohama 220, Japan;
Ph 81–45–223 1120; Fax 81–45–223 1121;
Email mjadams@itto.or.jp

To subscribe to Tropical Timber Market Information, *which is currently free-of-charge but which will become a fee-paying service as it gets established, please contact Dr Adams at the address above.*

Some *TFU* readers will have already been receiving *Tropical Timber Market Information*, the two-weekly report produced by the new Market Information Service at ITTO. These reports, which commenced in January, have widened the scope of ITTO's efforts to achieve greater market transparency in the tropical timber trade.

Greater market transparency should help address some of the trade imbalances – where either producers are trying to push up prices at a time when the market is weak or where consumers are trying to push down prices when supplies are tight – which seem to plague the tropical timber industry from time to time, often with disastrous results for producers and consumers alike. At the same time, greater transparency may help improve timber utilisation. Ultimately, and more importantly, it could help forest owners capture a fair share of the economic rent for such timber, which is essential if sustainable forest management is to be an economically attractive proposition.

The Changing Market Place

The trade in tropical logs and sawnwood has altered significantly in recent years and the pace of this change is accelerating. The number of countries either directly or indirectly restricting the export of logs is growing, as is the number of countries with fiscal disincentives or bans on sawnwood export. More and more of the products from the tropical forest are being consumed within the producing countries, reflecting a growing and more prosperous local population. These trends, combined with policies of producing countries to capture the economic benefits from local processing of previously exported commodities, continue to have a significant impact on the log and sawnwood trade.

In the plywood sector, generally considered as a commodity group, there are also some major changes taking place. The supply of large diameter logs for the plywood industry is on the decline. Similarly, the traditional and commercially well known timber species for plywood manufacture are becoming increasingly expensive to harvest (as logging shifts to less accessible areas). As a result, supplies of these timbers for plywood manufacture are declining. These changes in the plywood sector have coincided with a massive expansion of non-plywood wood-based panel manufacture, especially particleboard, medium density fibreboard (MDF), laminated veneer lumber (LVL) and the structural panel, oriented strandboard (OSB). Interestingly, many countries define these new wood-based panel mills as added value industries. Many can utilise mixed tropical hardwoods or tropical plantation timbers. The expansion of the particleboard and MDF manufacturing capacity in the tropics has been remarkable, with Asia and Latin America leading the way.

'The successful diversification of the tropical timber production sector in many countries is creating significant changes in the pattern of trade in tropical timbers.'

As the tropical timber commodity sector declines, the manufacturing sector is expanding. This trend is likely to continue as governments in the producing countries stimulate investment in manufacturing. The successful diversification of the tropical timber production sector in many countries is creating significant changes in the pattern of trade in tropical timbers.

The Role of *Tropical Timber Market Information*

This dynamism in the pattern of the tropical timber trade is creating a demand for information in new areas. Information is needed on changes in production capacity, product availability and definition, market trends, market distribution networks and consumer preferences. *Tropical Timber Market Information* is aimed at meeting this need, at least in part. Building progressively on a network of reliable sources we are providing information on prices for a range of tropical logs, sawnwood and plywood and some manufactured products. In each issue we are reporting on the US market. For the European furniture market we carry reports on the main consumers, each issue focusing on a single European market. Details on each market are updated every four to five weeks. In addition, producer prices and trade trends for downstream products are provided.

We hope that the commodity price information will be useful for exporters and traders and, along with freight rates, which are included regularly, will help producers identify comparative advantages in distribution. One of the possible consequences of highlighting commodity prices and commodity producers will be to focus the attention of potential investors on opportunities for downstream investment. All the countries currently exporting commodities are offering investment incentives and should be the target for investors. *Tropical Timber Market Information* offers commodity exporters another way to promote business investment and I would invite any producers who are not currently on our information network to consider providing ITTO with details of your production and exports.

ITTO's *Tropical Timber Market Information* concentrates solely on tropical timber products, providing commodity price information and commentary from a wide spectrum of sources. In addition, it attempts to go further by providing information on downstream tropical timber products prices, and news of opportunities in the main markets. A quarterly analysis and summary of trends will be reported in subsequent editions of the *TFU*. ITTO's *Tropical Timber Market Information*, taken together with other published market reports and market databases, should enhance the transparency of today's global tropical timber trade and contribute towards ensuring its sustainability. ■

Production and Trade of Tropical Logs

by Steven Johnson

ITTO Secretariat, Yokohama

Figure 1: Top five tropical log producers

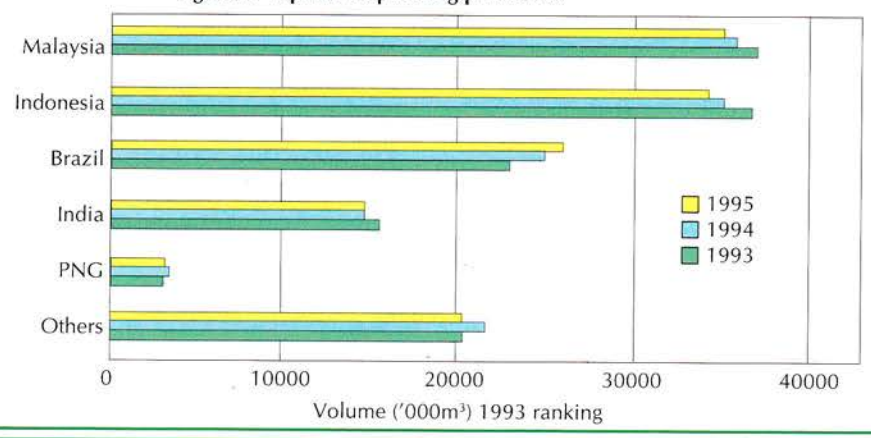


Figure 2: Top five tropical log consumers

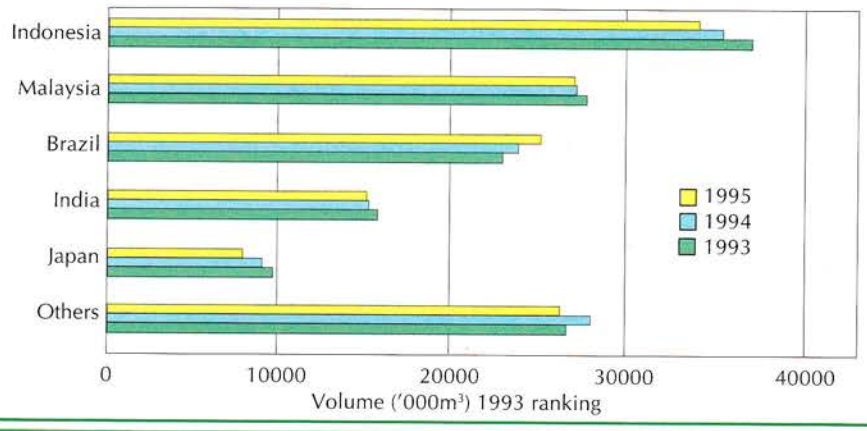


Figure 3: Top five tropical log exporters

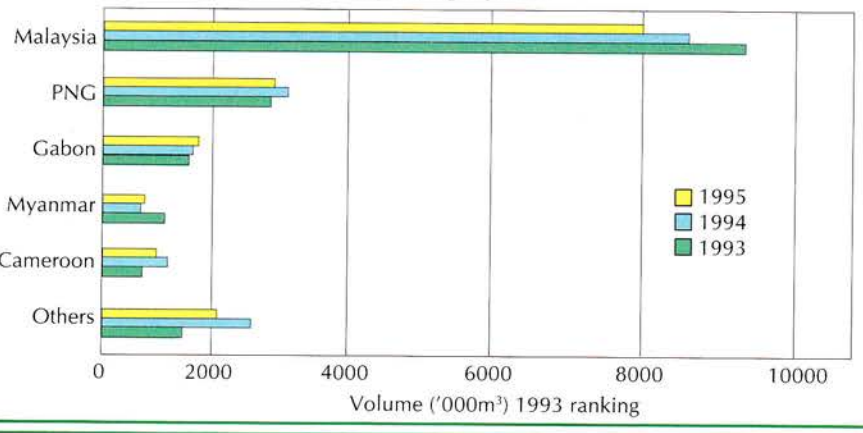
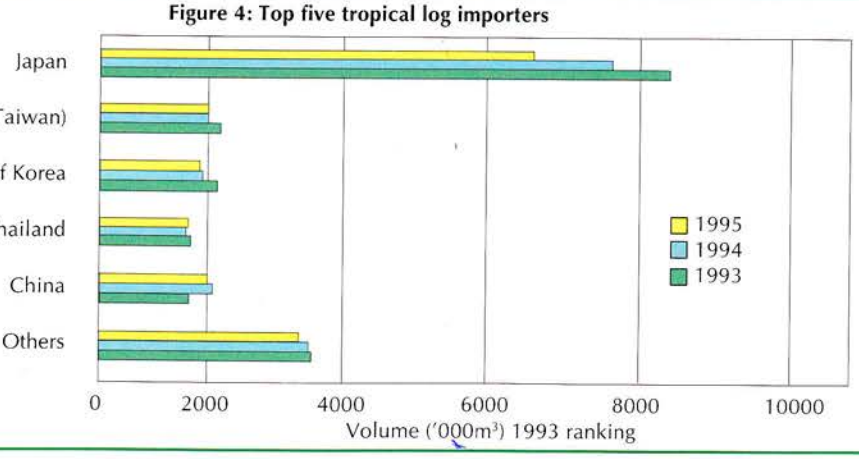


Figure 4: Top five tropical log importers



The 1995 *Annual Review and Assessment of the World Tropical Timber Situation* has recently been published following approval by the International Tropical Timber Council in November 1995 and the subsequent submission of new or corrected data by members. Starting with tropical logs in this issue, the *TFU* will summarise the production and trade statistics presented in the 1995 *Annual Review* for the four main products covered by the International Tropical Timber Agreement: logs, sawnwood, veneer and plywood. Figures for 1995 are based on estimates made in the third quarter of that year.

Log Production

The production of tropical saw/veneer logs in ITTO producer member countries totalled 132.8 million m^3 in 1995, down two per cent from 135.6 million m^3 in 1993. Decreases in Malaysian production were responsible for most of this decline, with most major African and Latin American producing countries increasing production in 1993–94 before stabilising in 1995. Figure 1 shows ITTO's five major tropical log producers through 1995, ranked by 1993 production, as well as aggregate production by all other members. Of the top five, only Brazil increased log production through 1995. Malaysian production, which peaked at 43.5 million m^3 in 1992, dropped to 35 million m^3 in 1995, a 20 per cent reduction in just three years.

Together, the top four tropical log producing countries (Malaysia, Indonesia, Brazil and India) comprise over 83 per cent of ITTO production. Papua New Guinea was the fifth largest ITTO log producer in 1993, but in 1994 Cameroon reported an increase in production of more than 1 million m^3 (to 3.9 million m^3) driven by a jump in exports to Asia, moving it ahead of

PNG in that year. Cameroon's 1995 production dropped back to 3 million m^3, so that PNG at 3.3 million m^3 regained its number five ranking.

Production increasing in some countries

Ten other ITTO producer members had log production exceeding one million m^3 in 1993. Half of these (Cameroon, Ecuador, Côte d'Ivoire, Gabon and Peru) had increased log production over 1993 levels in 1995, while production fell in the other five (Myanmar, Ghana, Venezuela, Philippines and Colombia) through 1995. Of the main producers, log production is increasing fastest (on average by almost 50 per cent since 1991) in PNG, Cameroon, Gabon and Peru.

The regional breakdown of tropical log production and exports is given in Table 1. The Asia-Pacific region's share of ITTO members' tropical hardwood log production fell to 67 per cent in 1995 from 71 per cent in 1993, due to Malaysian production decreases. Africa's share of production remained at 7 per cent over the period, with Latin American production growing from 22 to 25 percent.

Tropical Log Consumption

Figure 2 shows that tropical log consumption for 1993–95 was stable or decreasing in the main Asian markets of Indonesia, Malaysia, India and Japan, with only Brazil showing a steady increase over the period (note that Japan maintains and consumes significant stockpiles of tropical logs, accounting for the differences between consumption and import figures). These five countries accounted for an average of 81 per cent of total ITTO consumption of tropical logs in 1993–95. The general trend towards increasing domestic log consumption which has been apparent in recent years will accelerate and affect all regions in the next few years as tropical log supplies tighten and as increased processing capacity comes on line in producing countries.

Exports

The composition of exports for 1993–95 from ITTO producing regions is shown in Table 1. The contribution of logs to total tropical timber exports of ITTO producers in terms of roundwood equivalent (rwe) volume dropped from over 60 per cent in 1980 to an average of 26 per cent in 1993–95. A similar drop in log export revenues was observed. Only Africa continues to export a higher volume equivalent of logs than processed products, with log exports making up an average of 36 per cent of log production and 57 per cent of total rwe export volume in 1993–95. The Asia-Pacific region is rapidly replacing log exports with the export of processed products, spurred by Indonesian plywood exports and Malaysian exports of sawnwood, veneer and plywood. Asian tropical log exports made up 25 per cent of total rwe export volume in 1993–94 (13 per cent of log production), dropping to 23 per cent of total exports in 1995.

Latin American log exports increased in 1994–95 due to a reported increase from Brazil; this is probably at least partially pulpwood, although it was reported as tropical saw/veneer logs. Total rwe export volume as a percentage of log production increased from 14 to 18 per cent in Latin America and from 62 to 64 per cent in Africa over the period 1993–95, while the proportion of Asian log production which is ultimately exported fell to 55 per cent due to increasing domestic demand and decreasing log exports. Total ITTO producer member exports (rwe) fell three per cent from 63.8 million m^3 to 61.7 million m^3 in 1993–95.

Malaysia's log exports declining

Figure 3 shows the major ITTO tropical log exporters in 1993–95, ranked by 1993 export volume. Total ITTO producer member exports of 16.9 million m^3 were valued at almost $2.6 billion in 1993, the latest year for which aggregate trade values were available. Malaysia continues to dominate the trade in tropical logs, although export volumes from that country have declined steadily from the 9.4 million m^3 exported in 1993 to 8 million m^3 in 1995. These reductions are due to sharply decreased exports from Sarawak and Sabah, with an export ban in the latter reducing exports from over 3 million m^3 in the early 1990s to virtually nil in 1995. Sarawak's exports almost halved in the same period to the 1995 level of 8 million m^3 as domestic processing and reduced harvests combined to limit export supplies. Malaysia's log exports were worth over $1.2 billion in 1993, falling to less than US$1.1 billion in 1995.

Papua New Guinea is the second largest tropical log exporter, with 1995 exports of 2.9 million m^3 worth nearly US$400 million. The bulk of PNG's log exports go to Japan and the Republic of Korea. PNG's log export controls appear to be working, as the discrepancies between export/import reports identified in previous *Reviews* are becoming less significant.

Log export bans

Africa supplies the majority of the remainder of global tropical hardwood log exports. Gabon and Cameroon are the largest exporters, but Ghana, Côte d'Ivoire and Congo all exported substantial quantities of logs in 1993–95. All of these countries experienced large increases in exports in 1993–94, primarily to China, Korea and Japan, which sought new log supplies to offset decreases from Malaysia. Ghana's exports dropped sharply in 1995 due to a log export ban on several popular species. A similar ban announced in late 1995 by Côte d'Ivoire will reduce that country's exports in coming years. Liberia's civil war has led to drastic decreases in official production and exports. Unofficial exports exist, but reliable estimates are not available. Indonesia replaced log export bans with levies in 1993, but their magnitude (US$500–4500/$m^3$) continues to ensure that few

Table 1: Composition of exports by region, 1993–95 ('000 m^3 rwe)

	Log production			Log exports			Processed exports			Total exports		
Region	1993	1994	1995	1993	1994	1995	1993	1994	1995	1993	1994	1995
Africa	9097	10836	9660	3250	4003	3476	2418	2849	2742	5668	6852	6218
Asia-Pacific	96259	91674	89640	13281	12266	11608	40771	37718	37794	54052	49984	49402
Latin America	30204	32567	33509	251	1052	1050	3828	4526	5068	4079	5578	6118
Total	135560	135077	132809	16782	17321	16134	47016	45092	45603	63798	62413	61737

logs are exported legally. Nonetheless, some importing countries (eg China) reported substantial imports of Indonesian logs in 1993 and 1994.

Re-exports by consumers

Re-exports of logs by consumer countries fell eleven per cent to 88,000 m^3 in 1993, 70 per cent of which was accounted for by inter-European trade. Germany, France, Belgium/Luxembourg and the Netherlands were the major log re-exporters in 1993, selling tropical logs to each other and other European Union (EU) countries. The magnitude of the European trade declined through 1995 together with tropical log supplies in Europe, although figures on this trade are increasingly unreliable due to the abolition of customs frontiers within the EU. Total consumer country exports rose to 128,000 m^3 in 1995, however, due to an increase in exports reported from China. This is probably material from Hainan Island, although no details on this trade were available.

Imports

Figure 4 shows the top ITTO log importers in 1993–95, ranked by order of import volume in 1993. Japan still dominates the global tropical log market, with its demand continuing to be met primarily by output from Malaysia, which supplied 60 per cent of Japan's total tropical log imports of 7.6 million m^3 in 1994. Decreasing log exports from Sarawak and the export ban in Sabah have resulted in a greater diversity of suppliers to the Japanese market in recent years, including softwood and temperate hardwood log exporters. Japan has increased tropical log imports from Africa, with 1993–94 imports over five times the 100,000 m^3 imported in 1992, mostly from Gabon and Cameroon. Imports from PNG have also skyrocketed, increasing to 1.9 million m^3 in 1994 from 1.1 million m^3 in 1992. Increased imports from all of these sources as well as from other non-ITTO sources such as the Solomon Islands (which supplied Japan with almost 350,000 m^3 in 1995) have not been able to offset decreases from traditional sources, resulting in total Japanese imports of less than 6.6 million m^3 in 1995.

China is the second largest ITTO tropical log importer at 3.8 million m^3 in 1993, led by Taiwan Province of China's imports of almost 2.2 million m^3 (down 45 per cent from 1992 levels). Aggregate imports by China and Taiwan Province of China rose to 4 million m^3 in 1995, due to increases in imports by the mainland, mainly from Africa (Gabon and Cameroon) and PNG.

Processing capacity on the move

The Republic of Korea is also a major ITTO tropical log consumer, absorbing 2.1 million m^3 in 1993, mostly from Malaysia (45 per cent of total tropical log imports, down from 71 per cent in 1992) and PNG (34 per cent, up from 23 per cent in 1992). Korea's imports were down one-third from 1992 levels, with a further decrease to 1.9 million m^3 in 1994–95. Korea, like Japan and some other Asian consumers, is undertaking to shift processing capacity to producing countries, closer to resources and cheaper labour. Korea is also importing increased quantities of logs from Africa (primarily Ghana), with 1994 levels reaching 205,000 m^3 compared to 21,000 m^3 in 1992. Ghana's log export ban on most species in 1995 has forced Korea to look to other suppliers in Africa and elsewhere.

The EU countries imported over 2.4 million m^3 of tropical logs in 1993, most of which came from African producers. France remains the largest of the EU log importers, with imports of around 900,000 m^3 per year over the past five years. France's tropical log supplies come mainly from Gabon, Cameroon and Congo. Italy, Portugal and Spain are also major European log importers, with over 250,000 m^3 of log imports each in 1993. European log imports rose slightly to 2.5 million m^3 in 1994, before returning to 1993 levels in 1995, due to depressed demand and increased competition from Asian log buyers in Africa.

Producers become importers

Several ITTO producing countries have become net importers of logs, indicating the extent of wood shortages in their domestic forest sectors. Thailand (1.6 million m^3) and the Philippines (569,000 m^3) were the major ITTO producer country importers of tropical logs in 1993, reflecting resource scarcity and logging bans in these countries. Peninsular Malaysia has also recently become a significant tropical log importer, with imports doubling from 174,000 m^3 in 1993 to 350,000 m^3 in 1995. Total imports of tropical logs by ITTO producing members dropped sharply in 1993, to just over 2.6 million m^3. Total imports dropped again to under 2.5 million m^3 in 1994, and to 2.4 million m^3 in 1995. This demand is still substantial, however, and will, in combination with demand from traditional log consumers like Japan, Korea and China, place considerable pressure on the forest resources of the remaining log exporters.

Prices

Real export prices for African and Asian log species for 1990 up to mid-1995 presented in the 1995 *Review* were derived from the ITTO/ITC Market News Service for Tropical Timbers. Regular price reviews from ITTO's new Market Information Service (see page 19) will be included in forthcoming issues of the *TFU*.

Real export prices (FOB) for most important species of African log exports were relatively stable or declining during the 1993–95 period, although real prices of several species rose temporarily in mid-late 1994. This was primarily due to increased demand from Asian markets for these species. Real prices of most African log exports were relatively stable between \$100 and \$200/m^3 throughout the period, with only acajou, iroko, sapelli and sipo achieving prices over \$200/m^3 for any sustained period. Sipo appears to be the most valuable log species exported in large volumes from Africa, with real prices approaching \$400/m^3 in late 1994.

In contrast to African logs, real export prices of most species of Asian logs increased sharply in 1993 and early 1994, due to the perception of log shortages in Asia. Real prices more than tripled in dollar terms in some cases, causing substantial confusion in major markets. Prices underwent a generally steady decline throughout the last three quarters of 1994 as the Sabah export ban was relaxed (although few logs were subsequently exported) and importers adjusted to the new supply situation. However, real Asian log export prices in mid-1995 remained substantially (up to 100 percent) higher than before the 1993 price increase, when most prices had been relatively stable for at least two years.

The 1995 *Annual Review and Assessment of the World Tropical Timber Situation* is available from the ITTO Secretariat, address page 31. ■

Next issue:
Production and Trade of Tropical Sawnwood

Country Profile – Bolivia

by Ing. Javier López

Forest Policy Specialist, BOLFOR, La Paz

Bolivia, with a land area of 108 million hectares (m ha), is situated in the central part of South America and neighboured by Brazil, Peru, Paraguay, Argentina and Chile. The country can be split broadly into three regions: the largely unforested *altiplano* (highlands of the Andes mountain range) in which the capital, La Paz, is situated, *los valles* (the escarpment hills between the Andes and the lowlands), and *los llanos*, the lowland Amazonian forests in the north and east of the country. Bolivia is a land-locked country with formidable natural barriers to the outside world which in the past have restricted the country's capacity to export its commodities. A trans-continental highway is now under construction which, when completed, will have far-reaching implications for Bolivia's timber industry and its forest estate.

About 53.4 m ha (48 per cent of the land area) of Bolivia are classified as forests. Most are located in the departments of Santa Cruz (48 per cent), Beni (19 per cent), La Paz (11 per cent) and Pando (11 per cent). The annual deforestation rate has been estimated to be 168,000 hectares (0.3 per cent; MSDMA 1995) although FAO (1993) put the rate at an average of 1.2 per cent per year in the 1980s.

It is estimated that the country's forests contain a standing volume of about 1,412 million m^3 of timber. In 1994, three species (mara – *Swietenia macrophylla*, cedro – *Cedrela* spp., and roble – *Amburana cearensis*) constituted about 40 per cent of all timber harvested (CNF 1994). According to ITTO (1995), Bolivia exported 160,000 m^3 of sawn mara in the period 1992–93. Under a forestry law passed in 1974, the private sector has been granted rights by the government to harvest timber over about 22.5 m ha of forest (in 195 contract areas) in the departments of Santa Cruz (63.3 per cent), La Paz (14.7 per cent), Beni (18.4 per cent), and others (3.5 per cent), regardless of land tenure. Table 1 shows that timber production and exports both increased (except in the case of veneer) in the first half of this decade. In 1993, the country earned US$50.6 million from its timber exports (ITTO 1996).

The manufacturing sector of the timber industry is expanding, with increased production of semi-processed products like railway sleepers, wood frames, plywood and furniture. Certain non-wood forest products are also becoming more important as earners of foreign exchange. For example, the value of Brazil nuts (*Bertholletia excelsa*) exported from Bolivia increased from US$1.5 million in 1985 to US$15.8 million in 1994, due partly to increased in-country processing, partly to an increase in unit price and partly to increased production (CNF 1994). The export of canned palm hearts (*Euterpe* spp.) has also increased in both value and volume, up from US$10,000 (11,000 kg) in 1985 to US$6.3 million (3.6 million kg) in 1994 (CNF 1994). Conversely, rubber extraction has become less significant to the economy in recent years.

Sustainable development needed

Bolivia is a poor country. Although it has a relatively small population (7.9 million in 1993), it is growing rapidly (2.4 per cent per year), and the average annual per capita income was US$762 in 1993 (about one quarter of the average for South America). Efforts are being made through the newly created Ministry of Sustainable Development and Environment (itself part of moves to modernise the structure and organisation of the state) to promote a sustainable and socially just forest industry. The basis of this approach is laid out in new forestry legislation currently before the Senate.

To help it in its task, the Government of Bolivia invited ITTO to send an independent mission to recommend a strategy for the sustainable development of Bolivia's forest sector. The mission commenced in October 1995 and is due to deliver its final report to the ITTC in November this year. The mission was requested to make recommendations for an integrated national programme to enable Bolivia to (among other things):

- assess and monitor the composition and extent of its forest resources;
- develop a rational forest industry development plan in terms of types and number of industries;
- examine and analyse the nature of social pressures on forest lands and forest resources as they relate to promotion of sustainable management of timber producing forests;
- examine and promote ways and means to ensure that the development of forest industries takes into account the economic, social and other developmental needs of indigenous communities;
- examine its current legislation, concession and forest revenue systems and formulate legislative measures and equitable rates and systems of taxation that promote sustainable forest management;
- promote effective mechanisms and institutional structures to promote sustainable development of the forest sector; and
- assess its needs for human resource development with particular emphasis on the training needs of indigenous communities.

Table 1: Bolivian production and export of various wood products, 1990 and 1995 ('000 m^3)

Year	Logs		Sawn		Veneer		Plywood	
	Prod'n	Export	Prod'n	Export	Prod'n	Export	Prod'n	Export
1990	342	0	138	66	14	3	2	1
1995	500	20	235	200	5	3	10	5

Sources: ITTO 1995, 1996

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On the Conference Circuit

Biodiversity Convention Moves Forward

2nd Meeting of the Conference of the Parties to the Convention on Biological Diversity

Jakarta, Indonesia

6–17 November 1995

As of 29 January 1996, the Convention on Biological Diversity had been ratified by 140 countries. This meeting was attended by 115 Parties and the European Community, while 29 States and Palestine were present as observers. Observers from 13 United Nations bodies and specialised agencies, eight non-UN intergovernmental agencies and 145 non-governmental organisations also attended.

The Conference of the Parties (COP) considered a number of issues related to the functioning of the Convention, including scientific, technical and technological matters, matters related to financial resources and mechanism, conservation and sustainable use, access to genetic resources, the relationship between the Convention and other bodies, and a number of administrative matters. Twenty-three decisions were made at this meeting, some of which are summarised below.

- The COP decided that a clearing house mechanism should be developed to promote and facilitate technical and scientific cooperation. It will start with a pilot phase for 1996–7, which will encourage the development of a network of active partners (such as existing national, regional, subregional and international centres of relevant expertise, as well as governmental and non-governmental institutions and the private sector), provide information on and facilitate access to these partners, and support the active partners to develop specific training for the effective participation of users in the clearing house network;
- The COP decided that the restructured Global Environment Facility should continue to serve as the institutional structure to operate the financial mechanism under the Convention on an interim basis, until a decision can be taken on which institutional structure is to be designated. It was decided that the COP should endeavour to make such a decision at its third meeting;
- The COP requested the Executive Secretary to commission and carry out work on forests and biological diversity and on the relationship between indigenous and local communities and forests to assist the work of the Intergovernmental Panel on Forests (IPF). It also made a statement on biological diversity and forests that was forwarded to the IPF;
- The COP requested the Executive Secretary to liaise with the Secretariat of the World Trade Organization, particularly with regard to the issue of intellectual property rights. It requested that the Executive Secretary undertake a preliminary study which would focus on (i) exploring the relationship between intellectual property rights and the preservation and maintenance of traditional knowledge and practices of indigenous and local communities and the possible role of intellectual property rights in encouraging the equitable sharing of benefits arising from the use of such knowledge and practices; and (ii) inviting governments and other relevant stakeholders to submit case studies that address the role of intellectual property rights in the technology transfer process.

For a full report of this meeting, contact: Executive Secretary, Dr. Calestous Juma, Secretariat of the Convention on Biological Diversity, World Trade Centre, 413 St. Jacques St, Office 630, Montreal, Canada; Ph 1–514–288 2220; Fax 1–514–288 6588.

Generating Income for Local People

Regional Seminar on Income Generation through Community Forestry

Bangkok, Thailand

18–20 October 1995

This seminar brought together over 85 experts from throughout the region to discuss and document their experiences. The potential of income generation in community forestry is now widely recognised and accepted. Many community forestry projects are moving from phases of conservation and regeneration to how best to sustainably exploit forest products.

Income generation projects can create many benefits for local communities but can also prove problematic. Project managers need to deal with such issues as how to best share resources and profit, who will be in control of the product, and who and where is the buyer.

It was evident from the presentations made that projects and activities throughout the Southeast Asian region are providing a wide range of experiences. While some are just beginning, others have been going for many years. The main problems facing income generation projects are equity, the sharing of benefits, and sustainability. Another problem is that, often, community involvement in forest management does not go beyond the realm of degraded forests and lands: governments are reticent to hand over forests that still have revenue potential. As one speaker put it, it is the problem of small forests for small people. Questions raised during the conference included: is income generation the activity of last resort? is this the last thread holding local communities together? if a forest product has high income potential, will it be co-opted from the communities by more powerful forces?

Four working groups were formed to deliberate two main topics: groups one, two and three focused on facilitating income generation, while group four concentrated on the sustainability and future of income generation in community forestry.

The importance of analysing every step along the production and marketing chain was stressed. For example, in a recent project in far-western Nepal, a group identified a fabric that could be grown, woven and produced locally, did a market analysis, and determined that production of the product would have negligible detrimental environmental effects. The only aspect they did not take into account was a cultural one: when it came time to hold a meeting on who was going to sew the fabric into a ready-made product, only one person showed up – the village Kami, or clothes maker. It was then realised that although the financial prospects were great, the local community perceived that the actual sewing of the product was a low caste job and was prohibited by cultural norms.

Other issues were identified by seminar participants. For example, how can products that prove popular and remunerative be protected from over-exploitation? And, what techniques are available for imparting business skills to local communities? Often, local communities

can create a wonderful product but have no concept of how to market it and control its quality. To be truly participatory, local communities need to be involved with the whole production and marketing process.

The concept of 'trade, not aid' is gaining popularity in development projects throughout the world. Yet if development projects wish to enter the global economy then they too must be prepared to face fluctuations in the market, and recognise the hazards of opening up to a market-based economy. Although income generation has much potential for community forestry, the need for documentation, training and the free flow of information and ideas is more apparent than ever.

Alliance Formed in Mayan Rainforest

Conservation and Community Development in the Mayan Rainforest of Belize, Guatemala and Mexico

8–11 November 1995

Chetumal, Quintana Roo, México

Report by David Barton Bray[1] and Carlisle J. Levine[2]

[1] Foundation Representative for Mexico with the Inter-American Foundation and member of the Tropical Ecosystems Directorate of the US Man and the Biosphere Program

[2] Program Staff Assistant in the Offices for Mexico and Guatemala of the Inter-American Foundation

This conference was sponsored by the US Man and the Biosphere Tropical Ecosystems Directorate (USMAB/TED), the Inter-American Foundation, the Patronato para la Ecología y el Desarrollo Forestal de Quintana Roo, AC and the Sociedad de Productores Forestales Ejidales de Quintana Roo, SC. Over 100 representatives of community organisations, international and national non-governmental organisations, and the governments of Belize, Guatemala, Mexico, and the United States met to discuss their mutual interest in the sustainable development of the largest rainforest in the Americas north of the Amazon.

This rainforest is called different names in different countries, and in different regions of the same country, but it has seldom been seen as a whole by any of those concerned with it, whether communities, NGOs, or nations. While the concept of 'Mayan rainforest' is now gaining currency to denominate the area, there is little agreement as to its exact boundaries. Some have considered it to include only the contiguous rainforest composed of the bioreserves bordering one of the other countries, or that have protected corridors that connect them. But the workshop embraced a broader definition, without setting exact limits to the region. It emphatically included, however, the hundreds of thousands of hectares of tropical forests being managed by communities in central and southern Quintana Roo.

Participants presented the results of three years funding for conservation and development in the Mayan rainforest by the US Man and the Biosphere Program, evaluated current needs, and planned the next appropriate steps in the conservation and development of the forest*.

The conference provided a broad, participatory framework for sharing research findings and results of action strategies, and for establishing new international private and public networks for developing and conserving thriving biotic and human communities in the region. The conference included a series of roundtables on subjects such as ecotourism, forest regeneration, wildlife management, and community forestry. A final plenary session culminated in the founding of the Alliance for the Mayan Rainforest, dedicated to coordinating research and action projects and building communications networks within the tri-national region and beyond. Most notable about the conference was the inclusion of strong representation from grassroots organisations and resource users, whose perspectives largely shaped the conference's outcome.

Conference participants identified a number of key goals, the achievement of which would encourage conservation of the Mayan rainforest. On the practical level, they agreed to clarify concepts of conservation, development and management; exchange and disseminate successful models and case studies; and exchange and coordinate applied research. However, they also recognised that forest conservation depends on much more than methods and practices. Because forest communities themselves ought to have the greatest say in forest management, participants determined that it was essential to clarify and improve relations between non-governmental organisations and peasants; recognise peasants and 'users' as legitimate owners and principal beneficiaries; and define land tenure and appropriate politics. To this end, it was important to strengthen the voice of those devoted to the forest by forming a critical mass and a unified representation at the political and operational levels.

The Alliance for the Mayan Rainforest identified a number of important next steps in the process of promoting sustainable development in the forest. It plans to: develop systems suitable for local social, cultural and environmental conditions; create a forum that will improve communications and mechanisms to work with the government; develop and exchange communications methods, such as videos, etc; and collaborate with SEMARNAP, the Mexican government's natural resources agency, in research and training.

Edited proceedings of the conference will be published in Spanish and English, and will be the first major publication to focus on the Mayan rainforest as a region. A brief workshop report can be obtained from: Carlisle J. Levine, Inter-American Foundation, 901 N. Stuart St., Arlington, VA 22203, USA; Fax 1=703=841 3874. Further information about the Alliance for the Mayan Rainforest can be obtained from Patricia Negreros, Co-Chair, Department of Forestry, 251 Bessey Hall, Iowa State U., Ames, Iowa 50011–1021, USA; Ph 1–515–294 1166 or Hugo Galletti, Co-Chair, Reforma No. 21, CP 77000, Chetumal, Quintana Roo, Mexico; Ph/Fax 52–983–20742.

* The first meeting had been convened by the Central American Commission for the Environment and Development and USMAB/TED in February 1993 in Flores, Guatemala. See *The Maya Forest: Key Issues and Recommendations for Action, A Workshop Report*. US Department of State Publication 10082, Bureau of Oceans and International Environmental and Scientific Affairs.

Current Literature

Dudley, N., Jeanrenaud, J-P. and Sullivan, F. 1995. *Bad Harvest? The Timber Trade and the Degradation of the World's Forests.* Earthscan, London. xiv + 204 pp. £12.95.

Upton, C. and Bass, S. 1995. *The Forest Certification Handbook.* Earthscan, London. xx + 217 pp (including glossary). £19.95.

Both publications available from: Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK; Fax 44–171–278 1142.

Review by A. Sarre

Accepted wisdom says that the timber trade is not a major contributor to deforestation. A study carried out for ITTO, for example, stated that "Evidence on the linkages between tropical deforestation, timber production and the timber trade suggests that the (international) trade is not a major source of tropical deforestation" (LEEC 1993). *Bad Harvest*, on the other hand, sets out to show that "Far from being a minor cause of forest loss, as is often claimed, the industry is the *primary* cause of natural-forest loss in the temperate and boreal regions and a *major* cause everywhere else" (authors' italics). The claim is based on a number of considerations, including: comparing the location of timber trade operations with areas of high biological wealth, particularly in primary forests; looking at forest quality as well as quantity; extending the assessment to all forests rather than just tropical moist forests; including an assessment of illegal logging; and incorporating information about more general changes in global forest conditions.

The thesis is plausible; after all, in temperate and boreal forests at least, timber harvesting is often the main activity carried out, and it seems logical that it will also be the main source of degradation. This book "summarizes and updates a number of previous papers and reports, written mainly by Friends of the Earth International and WWF [World Wide Fund for Nature]". It would have benefited from a more thorough examination of the scientific literature. True, by their very nature not all the issues covered in this book have been the subject of scientific inquiry. But those that have – such as the role of logging roads in 'opening up' forests to settlers, and the effects of logging on biodiversity – could have been more thoroughly reviewed.

The result is a general lack of quantitative, tabulated data to assist arguments. Those tables that are included generally don't contain any data at all: for example, one table that assumes some significance in the concluding chapter consists of a list of countries and short statements describing the status of those country's forests. On their own, these statements are not particularly useful. In Bolivia, for example, "Forest loss has now reached critical levels in some areas", while in Australia, "Logging is the major cause of forest degradation and loss, particularly in the south west and Tasmania". Such statements must be accompanied by data, or at the very least references, if they are to be anything more than flags for activists.

Bad Harvest covers some interesting – and often poorly documented – aspects of the modern timber trade, including illegal logging (this is surely an area that deserves greater international attention), the role of transnational corporations and the pulp and paper industry. It also provides an analysis of recent international policy initiatives, including certification, and presents WWF's global forest strategy as an alternative to the status quo. The authors, all employed by WWF, speak of being "frustrated, angry and sometimes appalled" by the actions of many in the timber trade. Nevertheless, they leave the door open, concluding their book with the following words: "We call on the timber trade to respond positively to the challenge of forest sustainability, and to work with the environmental movement in realizing the vision of a world full of high quality forests."

This brings us to *The Forest Certification Handbook*, which is less ambitious than *Bad Harvest* although it touches on a similar broad range of policy issues. The first-named author is also a certifier, and one might expect this to colour the emphasis of the book, but it is in fact a clear, objective and thorough presentation of the pros and cons of forest certification. It starts by setting certification in context by outlining the major "forest problems", the policies needed to correct these, and a detailed discussion of standards by which to judge forest management (a knotty issue, since, as pointed out in *Bad Harvest*, nobody knows what is truly 'sustainable' – is logging at any scale sustainable in a natural forest?). Against this background, the potential role of forest certification in achieving better forest management is discussed. The authors conclude, rather boringly, that "It seems that under certain circumstances, certification can be an effective market-based instrument", and they provide some tentative observations on potential positive spin-offs.

The second part of the book looks at certification in practice, and should be essential reading to anyone trying to get their mind around the mechanics of the concept. Part 3 provides an analysis of international initiatives, largely as they relate to certification, covering similar ground to that covered by *Bad Harvest* but with a slightly more upbeat perspective. Views on certification from various stakeholders are also presented. The final part of the book lists active certification programmes, describes international and national certification initiatives, and gives details of all the independently-certified forests as of June 1995.

On the face of it, certification is the ideal meeting ground for the trade and the environmental movement. The authors of *Bad Harvest* support, in principle, the harvesting of timber, saying that "Timber from forests that are well managed, from a broad social and environmental perspective, remains one of the most environmentally-friendly products available", but they will only believe industry claims of good management if they are assessed independently – that is, certified by third parties who themselves have been accredited by the Forest Stewardship Council. Neither they, or the authors of the *Handbook*, claim that certification is a complete answer, because fundamental policy issues at the national and international levels must also be resolved. Nevertheless, it could lead to positive changes in some forests and perhaps, as Upton and Bass suggest, could help create "a climate of change for policy and legislative reform". Let's hope for good harvests in the future.

Manokaran, N. and Swaine, M.D. 1994. *Population Dynamics of Trees in Dipterocarp Forests of Peninsular Malaysia.* Malayan Forest Records No. 40. Forest Research Institute Malaysia. Kuala Lumpur. Price: MR50 (US$21)

Available from: Mr. Khoo Kean Choon (Chief Editor), Forest Research Institute Malaysia, Kepong 52190 Kuala Lumpur, Malaysia.

Review by Dr. Kevin Grace

Gaya Tunas, Kuala Lumpur

This book is styled like the PhD dissertation for which the study was conducted. The study analyses the stand dynamics and floristic composition of two-hectare permanent growth plots at three different locations. Two of the locations, each containing one growth plot, were established in 1947 while the third site contained five growth plots and was established in 1971. The sites were selected as representative of undisturbed mature dipterocarp forests.

Results of the study (which constitute the major portion of the book) begin with comparisons of the sites by floristic composition and changes in composition over time. Mortality is discussed based on a calculated population 'half-life' for size classes, ecological groups, spatial patterns, etc. Tree growth is discussed according to common species, size classes, and timber density of individual trees. Recruitment and floristic changes are presented in a similar manner. In general, the authors found that mortality was not correlated to size class but was high for trees with no growth. Growth rates were highly variable even within species. Variation of floristic composition within a site over 38 years was very slight relative to between sites. The forests were considered structurally stable in terms of basal area and size class distribution.

One negative aspect of the book is that the authors often present information on attributes of growth and mortality of individual trees as well as subsets of data, causing the reader to lose focus on the general ecological principles being discussed. Sections concerning methodologies and discussion could also have been expanded. However, the book provides valuable information on mature multi-species dipterocarp forests which is essential to understanding the ecological processes naturally occurring in tropical forests.

Soepadmo, E. and Wong, K.M. (eds.) 1995. *Tree Flora of Sabah and Sarawak. Volume 1.* Forest Research Institute Malaysia, Kuala Lumpur. 513 pp.

Available from FRIM, Kepong, 52109 Kuala Lumpur, Malaysia.

Kessler, P.J.A. and Sidiyasa, K. 1994. *Trees of the Balikpapan-Samarinda Area, East Kalimantan, Indonesia: a Manual to 280 Selected Species.* Tropenbos Series No. 7. Backhuys Publishers. 95 Dutch Gilders.

Available from: Backhuys Publishers, PO Box 321, 2300 AH Leiden, the Netherlands.

Lemmens, R.H.M.J., Soerianegara, I. and Wong, W.C. (eds.) 1995. *Plant Resources of South-East Asia. No. 5(2) Timber Trees: Minor Commercial Timbers.* Backhuys Publishers, Leiden. 655 pp.

Available from: Backhuys Publishers, PO Box 321, 2300 AH Leiden, the Netherlands.

There has long been intense scientific interest in the flora of Borneo. This is illustrated by a glance at a summary of collectors since 1822 contained in *Tree Flora* – over the years, some of botany's most famous names have visited the island armed with machete and plant press. Yet Professor Soepadmo notes in *Tree Flora* that "to date this species-rich island has neither a comprehensive flora of any kind nor even a concise checklist of plant species". These three books should help to fill the void. *Tree Flora*, developed with the assistance of ITTO, is the first of what is hoped to be at least eight volumes covering over 2,400 tree species (defined as those reaching at least five metres in height and ten centimetres in diameter) that are native to Sabah and Sarawak. The second book, *Trees of the Balikpapan-Samarinda Area*, is restricted in range, covering a relatively small part of Borneo on the east coast, and is designed primarily as a field manual for identification of the more economically important tree species in the region. *Plant Resources*, also funded by, among others, ITTO, is the broadest in scope of the three books, and is the second of three planned volumes covering the timber trees of Southeast Asia under the Plant Resources of South-East Asia (PROSEA) series (see *TFU* 5:2 for a review of the first).

Recent Editions

Subbarao, N.S. and Rodríguez-Barrueco, C. 1995. *Casuarinas.* Science Publishers, Inc. Lebanon, USA.

Available from: Science Publishers, Inc., 52 LaBombard Road North, Lebanon NH 03766, USA. US$75.

Sankara Pillai, K., Sarojam, N., Ravindran, K. and Hussain, K.H. 1994. *Bamboo Researchers and Projects of South and South-East Asia.* Kerala Forest Research Institute. Peechi.

Available from: Kerala Forest Research Institute, Peechi 680 653, Trichur, India. US$15.

Renuka, C. 1995. *A Manual of the Rattans of Andaman and Nicobar Islands.* Kerala Forest Research Institute, Peechi.

Available from: The Librarian, Kerala Forest Research Institute, Peechi 680 653, Trichur, India. US$20 (175 Indian rupees).

Roggeri, H. 1995. *Tropical Freshwater Wetlands: A Guide to Current Knowledge and Sustainable Management.* Kluwer, Dordrecht. Hardbound, 364 pp.

Available from: Kluwer Academic Publ. Group, Order Dept., PO Box 322, 3300 AH Dordrecht, The Netherlands; Fax 31–78–654 6474. US$134.

Sinclair, F. L. (ed.) 1995. *Agroforestry: Science, Policy and Practice: Selected Papers from the Agroforestry Sessions of the IUFRO 20th World Congress, Tampere, Finland, 6–12 August 1995.* Kluwer, Dordrecht. 296 pp. Hardbound, ISBN 0–7923–3696–8.

Available from: Kluwer Academic Publ. Group, Order Dept., PO Box 322, 3300 AH Dordrecht, The Netherlands; Fax 31–78–654 6474.

Alder, D. 1995.* Growth and Modelling for Mixed Tropical Forests. *Tropical Forestry Papers #30. Oxford Forestry Institute, Oxford. ISBN 0-85074-135.1.

Available from: Library and Information Service, Oxford Forestry Institute, University of Oxford, South Parks Road, Oxford OX1 3RB, UK; Fax 44–1865–275 074. £13.50 plus handling and postage.

FAO 1995.* Directory of Forestry Research Organizations 1995. *FAO, Rome.

Available from: FAO Distributions and Sales Division, FAO, Viale delle Terme di Caracalla, 00100, Rome, Italy. Price not specified.

Topical and Tropical

What's making the news in international forestry

Edited by Alistair Sarre

Habitat Renewal

In a recent paper in *Ecological Applications* (5:3, 579–587, August 1995), Tony Sinclair and five co-authors draw some disturbing conclusions about current efforts to conserve biodiversity. Drawing on several empirical studies, they suggest that habitat decay both in and outside reserves will result in the eventual total loss of those habitats, unless decay is balanced by habitat renewal. At the moment, say the authors, habitat decay is occurring at a much greater rate than renewal in all habitats due to a wide range of human-related factors. To maintain (a pre-determined level of) habitat it will be necessary to replace it before or at the same time as other portions of the habitat are exploited. Thus, if 100 hectares of old-growth forest is to be logged, "then another 100 ha of old-growth forest must be grown before the logging, not 200 [years] later". Habitat reservation does "buy time" for conservation, but the authors argue that unless this time is used to implement habitat renewal, "conservation will not counter the decline of biological diversity".

Joint Forest Management News

According to V.S.P. Kurup, editor of *Wastelands News*, joint forest management (JFM) implies the sharing of all forest produce with local communities in return for their care for and protection of forests. In recent years, JFM has received considerable attention, both in India (where it has taken firm root) and internationally. *Wastelands News* is published quarterly in India by the Society for Promotion of Wastelands Development (SPWD), a national NGO, and provides information on issues relating to JFM and wastelands development. Subscribe by contacting: The Editor, *Wastelands News*, SPWD, Shriram Bharatiya, Kala Kendra Building, 1, Copernicus Marg, New Delhi–110001, India; Fax 91–11–338 2633. Cost: Rs 40/- per year within India; US$15 for overseas subscription.

Model Forests on the Move

The Canadian Forest Service announced last October that the Secretariat for the International Model Forest Network had moved to the International Development Research Centre (IRDC) in Ottawa, Canada. Currently, the International Model Forest Network is comprised of 18 model forest sites in five countries – Canada, Mexico, Russia, Malaysia and the United States. Model forests are designed to bring together industry, indigenous peoples, environmentalists, community associations and other relevant interests to develop joint approaches to sustainable forest management. They are dedicated to the exchange of information and expertise, the testing of sustainable forestry practices and the encouragement of innovative partnerships.

For more information on the network, contact its Secretariat at: IDRC, 250 Albert Street, 13th Floor, Ottawa, Ontario K1G 3H9, Canada; Fax 1–613–234 7457; Email Fjohnson@idrc.ca

Canopies by Cable

In a paper published in *Phyton – Annales Rei Botanicae* (35:1, 165–173, 1995), Gottsberger and Döring propose a system to facilitate long-term studies of tropical forest canopies. Present methods, such as the use of binoculars, fogging, climbing, suspension bridges, dirigible hot air balloons and construction cranes all have limitations which reduce their effectiveness. The authors introduce what they call the Canopy Operation Permanent Access System (COPAS). The system would consist of three (or more) towers placed in a triangular formation within a forest, their height exceeding that of the canopy. A stationary supporting rope would be strung between two of the towers. A second rope would be strung between the other tower and the first rope and would carry a gondola. The gondola would bear the researchers and would be capable of moving in all directions (including up and down). The authors say that technical difficulties have been overcome and the system should be trialed soon.

Social Forestry Theory

M.R. Dove, in a paper in *Agroforestry Systems* (30: 315–340; 1995), examines some of the major issues in social forestry theory in Asia. He suggests that while the theoretical basis for planning forestry activities that involve local communities is complex and challenging, the theory actually articulated in most social forestry interventions is, by contrast, simplistic. For example, "the orthodox view that deforestation is a gradual process driven by community-based determinants is opposed by a community view that deforestation is a stochastic [ie random] process driven by political-economic determinants outside the community". And, while change within the forestry agency is often essential for the success of social forestry initiatives, interventions can be used by the agency to resist change – "when the forestry institution has not been changed, any resource that comes into its hands (regardless of its intended purpose) will be turned to its own institutionally defined ends".

The author draws an anology between the process of natural forest regeneration and the development of community-based forest management: "in both cases the ideal role for planners may be not to add or design anything new, but simply to recognize the indigenous processes at work and support them where possible." As a result of his analysis, the author suggests that "it is now time for social forestry practioners to be sensitized to theory – for it is this that will determine whether the [social forestry] technology will achieve, in the long run, what it is intended to achieve."

Belgium and Cameroon Consult

According to a press release from the World Wide Fund for Nature (WWF) Belgium, the Belgian Timber Federation and WWF consulted recently with government officials, NGOs and major concessionaires in Cameroon, with a view to obtaining a supply of certified wood products for the Belgian market. In 1994, a voluntary club of timber industrialists was formed in collaboration with WWF in Belgium to usher in the sale of certified timber by the beginning of 1997. This 'Club 1997' is now composed of more than 50 timber companies. The reactions of the majority of stakeholders in Cameroon to the approach was reported as positive, and there was agreement that certification could help the application of new forest legislation and sustainable forest management in the field. According to ITTO data, Belgium and Luxembourg (whose statistics are aggregated) imported 335,000 m^3 of tropical logs, sawnwood, veneer and plywood in 1995. ■

Letters to the Editor

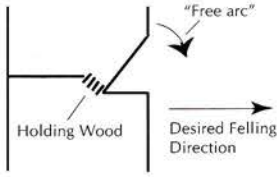
Directional Felling: Which Way?

Sir

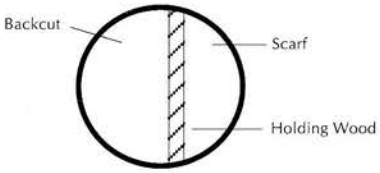
I feel I must comment on the picture used in the article on 'Demonstrating directional felling in Cameroon' (*TFU* 5:3, p11). This comment is intended as constructive criticism only on what is generally an excellent and informative bulletin.

Anybody who has been involved in teaching directional felling realises that two of the many critical factors in directional felling are:

1. Scarf cuts must match perfectly to ensure the tree's fall in unimpeded. Early closing of the scarf results in premature breakage of the hingewood with the subsequent loss of control.



2. Hingewood (holding wood) is the 'hinge' that controls the tree's direction of fall. It should never be cut. Cutting the hingewood causes loss of control.



It appears in the picture used that both these factors have been ignored. We are all in the business of reducing the impact of logging. Therefore I suggest in future careful selection of photographs that support, not contradict, the text.

Ross Andrewartha

Training Advisor, Vanuatu Sustainable Forest Utilisation Project, Vanuatu

22 November 1995

Dr Jonkers responds:

I agree with Mr. Andrewartha's description of proper felling, but I do not agree with his comment that the photograph contradicts the text. It shows the instructor cutting a buttress, and not the hingewood as Mr Andrawartha's comment suggests.

The Real Bottom Line

Sir

In regard to your editorial and other items on the need for forest to 'Pay their Way' (*TFU* 5:4, December 1995), forests can't survive if they are evaluated in mainly economic terms:

1) all minor (deferred) profits can't compete against the major (immediate) profit which is realised from cutting down trees and selling the timber;
2) political lifetimes are traditionally short (average of four years) therefore it doesn't motivate politicians to take a view longer than this. Obviously trees, which generally take up to 20 years to reach at least marketing maturity, span more than one political term and are usually beyond the concern of those who could legislate protection: politics, of course, is driven by economic goals;
3) any way of 'managing' forest which is not ecologically modelled is bound to fail in that forests are complex, evolved ecosystems, whereas economics is a very recent newcomer with no track record of long-time success and extremely simplistic in concept.

It is not just in political or economic interests that forests 'pay their way' – it is in humanity's interest! If forest cover world-wide is removed (for whatever motives), this will cause such a rending of the Web of Life that it is highly unlikely that humans can survive as a species. Given the wild swings in current weather patterns with strong implications for an underlying global climate shift, it is not sure if the forests will survive whether they can 'pay their way' or not.

We appreciate who funds this newsletter and who the audience is, but we feel that time is overdue when our thoughts need to be on issues more critical than monetary profit in whatever form. Here is the real Bottom Line – the longer we delay, the more it will cost to repair the damage!

Steve & Paula Friedman

Genesis II Cloudforest Preserve, APDO 655, Cartago, Costa Rica

23 January 1996

Editor's note: the *TFU* is funded by the International Tropical Timber Organization, an intergovernmental body established under the auspices of the United Nations. Governments which have provided funding for the newsletter through ITTO are those of Japan, Denmark, USA, Australia and Switzerland.

Making Contact

I would like to make contact with people working in the field of forest fire management.

Preferred language: English

Rey S. Ofren, Department of Geography, University of Auckland, Private Bag 92019, Auckland, New Zealand; Fax 64–9–373 7434; Email r.ofren@auckland.ac.nz

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We are a conservation NGO working on the utilisation of neem and some other species, and the introduction of such trees to agroforestry. We would like to make contact with people, NGOs and INGOs working in this field.

Preferred language: English

Contact: Rabindra N. Shukla, Nepal Eco-Essential Medicinal Plants (NEEM) Society, Tribhuwan Chowk (East), Nepalgunj, Nepal; Fax 977–81–21299.

I would like to make contact with people who are working in the assessment and monitoring of tropical rainforests, particularly biodiversity in natural forests.

Preferred language: English

Contact: Dr M. K. Hossain, Institute of Forestry, Chittagong University, Chittagong 4331, Bangladesh; Fax 880–31–225004.

I'd like to get in touch with people working on rehabilitation of degraded land/grassland and on the potential of indigenous species/ lesser known species in reforestation.

Preferred language: English

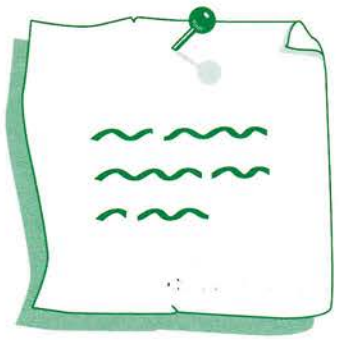
Contact: Calixto E. Yao, Department of Environment and Natural Resources, Region 7, Penro, Siquijor, the Philippines.

I would like to make contact with researchers or organisations working on the biological control of forest pests, especially those working on Psyllids and/or gall-forming insects. My work centres on survey and evaluation of natural enemies.

Preferred language: English

Contact: Mr Paul Pinnock Bosu, Forestry Research Institute of Ghana, PO Box 63, University, Kumasi, Ghana.

Noticeboard



Proceedings Available

Westley, S. & Roshetko, J. (eds.) *Dalbergia: Proceedings of an International Workshop.* 1994. *Nitrogen Fixing Tree Research Reports* Special Issue 1994.

Available from: Nitrogen Fixing Tree Association, c/o Winrock International, Petit Jean Mountain, Morrilton, Arkansas 72110–9537, USA. Cost not specified.

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Available from: Environment Division, Inter-American Development Bank, 1300 New York Avenue, N.W., Washington, D.C. 20577, USA. Cost not specified.

Boyle, T. & Boonchoob Boonatawee (eds.) *Measuring and Monitoring Biodiversity in Tropical and Temperate Forests.* 1994. Proceedings of an IUFRO Symposium held at Chiang Mai, Thailand, 27 August–2 September 1994. CIFOR.

Available from: Librarian, CIFOR, PO Box 6596, JKPWB Jakarta, Indonesia 10065; Fax 62–251–326 433; Email Y.Soeripto @cgnet.com. US$15. (Preferred payment: Mastercard or Visa; no cheques.)

Proceedings of the Africa GIS Conference, held 6–10 March 1995 in Abidjan, Côte d'Ivoire.

Available from: Christophe Nuttall, Administrateur de programme, OSS/UNITAR, palais des nations, CH–1211, Geneva, Switzerland; Fax 41–22–733 1383; Email christophe.nuttall@itu.ch. Papers are in French or English. US$25. ■

Masters Scholarship Available

England's Oxford University is able to fund a student on the MSc course 'Forestry and its Relation to Land Use' for the academic year beginning this October, or October 1997. To qualify, candidates:

- must be under the age of 35;
- must be living in a developing British Commonwealth country;
- must not be employed by a government department (national or local), or a parastatal organisation;
- must certify that they would otherwise be unable to afford the cost of study in Britain; and
- must certify that they will return to work in their home country as soon as the award ends.

In addition, candidates must be exceptionally able academically, having a first degree which is of at least the equivalent standard of a British upper second class honours degree in a biological subject, and at least a year of postgraduate experience, working in forestry or some closely related area.

For more information, contact: Peter Savill, Oxford Forestry Institute, Department of Plant Sciences, South Parks Road, Oxford OX1 3RB, UK; Ph 44–1865–275 000; Fax 44–1865–275 074; Email peter.savill@plantsciences.oxford.ac.uk ■

Network of Forestry Editors

A network of forestry editors has been established following a workshop held by the Centre for International Forestry Research (CIFOR). The goals of the network are:

- to improve standards in forestry editing and publishing;
- to establish and promote worldwide standards for forestry publications;
- to identify and help forestry editors solve problems; and
- to spread and nurture editing and publishing skills.

Membership is open to all forestry editors, and CIFOR acts as the network's secretariat. For more information, contact: Dr Francis Ng, CIFOR, PO Box 6596, JKPWB Jakarta 10065, Indonesia; Fax 62–251–32 6433; Email cifor@cgnet.com ■

Permanent Plot Information

As part of the larger TROPIS (Tree Growth Potential Information System) project, the Centre for International Forestry Research (CIFOR) is compiling an index of permanent plots in the tropics (or with species often grown in the tropics) and offering a search facility to help put researchers and potential collaborators in touch. The TROPIS index does not contain any growth data, but contains a summary of plot objectives, location, species, history and people involved. Anyone may request a search of the index, and will be supplied with a list of plots matching their criteria and details of people to contact about the data. It will be up to the individual concerned to approach the data owners and agree to share their data.

Hopefully this service will lead to mutually beneficial collaboration between many researchers. Of course, the quality of the service CIFOR can offer depends largely on the willingness of data owners to contribute information on their plots. If you have information on permanent plots in plantation or natural forests in the tropics, I would like to hear from you.

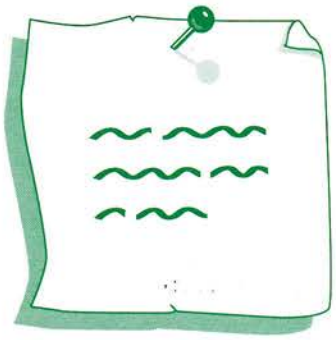
Jerry Vanclay, CIFOR, PO Box 6596, JKPWB Jakarta 10065, Indonesia; Fax 62–251–32 6433; Email J.Vanclay@cgnet.com ■

ITTO Fellowships

Under its Fellowship and Small Grants Programme, the International Tropical Timber Organization (ITTO) offers fellowships for short-term activities such as visits to forests, mills and research or educational institutions and participation in seminars, workshops, training courses and conferences. Fellowships are not offered for long-term courses leading to diplomas or higher degrees. Only nationals of ITTO member countries are eligible to apply.

Applications may be in English, French or Spanish. Further details on eligibility and application forms are available from: The Executive Director, ITTO (see address on page 31). Next deadline for applications: 13 September 1996. Applicants are advised that fellowship activities must commence after the 21st ITTC Session (ending 20 November 1996) and applicants whose proposed activities are scheduled to start within one month of the end of the Session must be prepared to pre-finance their work. ■

Noticeboard



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Membership is open to all forestry editors, and CIFOR acts as the network's secretariat. For more information, contact: Dr Francis Ng, CIFOR, PO Box 6596, JKPWB Jakarta 10065, Indonesia; Fax 62–251–32 6433; Email cifor@cgnet.com ■

Permanent Plot Information

As part of the larger TROPIS (Tree Growth Potential Information System) project, the Centre for International Forestry Research (CIFOR) is compiling an index of permanent plots in the tropics (or with species often grown in the tropics) and offering a search facility to help put researchers and potential collaborators in touch. The TROPIS index does not contain any growth data, but contains a summary of plot objectives, location, species, history and people involved. Anyone may request a search of the index, and will be supplied with a list of plots matching their criteria and details of people to contact about the data. It will be up to the individual concerned to approach the data owners and agree to share their data.

Hopefully this service will lead to mutually beneficial collaboration between many researchers. Of course, the quality of the service CIFOR can offer depends largely on the willingness of data owners to contribute information on their plots. If you have information on permanent plots in plantation or natural forests in the tropics, I would like to hear from you.

Jerry Vanclay, CIFOR, PO Box 6596, JKPWB Jakarta 10065, Indonesia; Fax 62–251–32 6433; Email J.Vanclay@cgnet.com ■

ITTO Fellowships

Under its Fellowship and Small Grants Programme, the International Tropical Timber Organization (ITTO) offers fellowships for short-term activities such as visits to forests, mills and research or educational institutions and participation in seminars, workshops, training courses and conferences. Fellowships are not offered for long-term courses leading to diplomas or higher degrees. Only nationals of ITTO member countries are eligible to apply.

Applications may be in English, French or Spanish. Further details on eligibility and application forms are available from: The Executive Director, ITTO (see address on page 31). Next deadline for applications: 13 September 1996. Applicants are advised that fellowship activities must commence after the 21st ITTC Session (ending 20 November 1996) and applicants whose proposed activities are scheduled to start within one month of the end of the Session must be prepared to pre-finance their work. ■

Course Calendar

◆ **Making Forest Policy Work**

1. Key Issues Update (week 1) 1–5 July 96

2. Policy in Practice (weeks 2–4) 8–26 July 96

Oxford, UK Cost: £3,000–3,500 (all 4 weeks, excl. accomm.)

This programme consists of 1) a week of one day seminars and 2) three weeks of course work. The seminars (which can be attended without the need to attend the three weeks of course work) will each be addressed by internationally acknowledged experts and their scope will be global. The course work focuses on processes and actions which help develop and implement forest policy solutions.

Contact: Kate Harris, Course Coordinator, Oxford Forestry Institute, Department of Plant Sciences, University of Oxford, South Parks Road, Oxford OX1 3RB, UK; Fax 44–1865–275 074; Email ofi@plant-sciences.oxford.ac.uk

◆ **Community Forestry Extension**

1–26 July 96 Bangkok, Thailand

Language: English Cost: US$4,000

The primary objective of this course, which is run in collaboration with the UK's University of Reading, is to develop the skills required to determine the needs of rural communities and to ensure their participation in community forestry programmes.

Contact: Dr Sukwong Somsak, Regional Community Forestry Training Center, Kasetsart University, PO Box 1111, Bangkok 10903, Thailand; Fax 662–561 4880; Email ftcsss@nontri.ku.ac.th

◆ **Certificate Course in Community Forestry**

12 Aug – 13 Dec 96 Bangkok, Thailand

Language: English Cost: US$9,900

Course objectives are to develop the skills to plan and implement community forestry activities with villagers, to develop the knowledge and skills to advise villagers in the management of forest and tree resources and to act the role of facilitators between local people and the government.

Contact: Dr Sukwong Somsak, Regional Community Forestry Training Center, Kasetsart University, PO Box 1111, Bangkok 10903, Thailand; Fax 662–561 4880; Email ftcsss@nontri.ku.ac.th

◆ **Agroforestry: Trees in Support of Agriculture**

5–30 August 96 Oxford, UK

Language: English Cost: £3,000 (excl. accommodation)

This course confronts the key issues of agroforestry, including technical aspects of growing trees and crops together, social factors and research.

Contact: Kate Harris, Course Coordinator, Oxford Forestry Institute, Department of Plant Sciences, University of Oxford, South Parks Road, Oxford OX1 3RB, UK; Fax 44–1865–275 074; Email ofi@plant-sciences.oxford.ac.uk

◆ **Tropical Plantation Forestry and Rehabilitation of Degraded Lands**

3 Aug–13 Sept 96 Queensland, Australia

Language: English Cost: A$12,000 (inclusive)

The course focuses on hands-on training and develops an integrated picture of how to establish hardwood and softwood plantations in the tropics and how this land use strategy can be used successfully to rehabilitate degraded lands.

Contact: Course Secretariat, Plantation Forestry Course, Queensland Forest Research Institute, M.S. 483, Gympie Qld 4570, Australia; Fax 61–74–828 755; Email russell@qfri.se2.dpi.qld.gov.au

◆ **Forest Conservation Genetics: Principles and Practice**

23 Sept – 4 Oct 96 Canberra, Australia

Language: English Cost: A$4,850 (inclusive)

This intensive course, conducted by scientists from the Australian National University, CSIRO, CIFOR and the Oxford Forestry Institute, is designed for all those working in forestry and natural resources who could fulfil their objectives and responsibilities more effectively if they were better informed about the principles and practice of forest biodiversity conservation.

Contact: David Brett, Forestry and Environment Division, ANUTECH Pty Ltd, GPO Box 4, Canberra 2601, Australia; Fax 61–61–249 5875.

◆ **Environmental Assessment for Development Projects**

30 Sept – 25 Oct 96 Canberra, Australia

Language: English Cost: A$8,200 (inclusive)

This intensive four-week course, which draws on experience and skills within the Australian National University, is designed for resource planners, project managers and technical experts to develop effective skills in environmental assessment for use in project planning and management.

Contact: Mr George Collett, ANUTECH Pty Ltd, GPO Box 4, Canberra 2601, Australia; Fax 61–6–249 5875; Ph 61–6–249 5671; Email george.collett@aplemail.anu.edu.au

◆ **Integrated Forestry Planning – Community Needs and Sustainable Management**

11 Nov – 20 Dec 96 Canberra & Queensland, Australia

Language: English Cost: A$11,400 (inclusive)

This course aims to give forest sector managers the skills and knowledge they need to foster participatory forestry practices that will help restore degraded land, protect water catchments and species-rich forests and ensure environmentally sustainable management.

Contact: David Brett, Forestry and Environment Division, ANUTECH Pty Ltd, GPO Box 4, Canberra 2601, Australia; Fax 61–61–249 5875. ■

ASEAN Institute of Forest Management GIS Courses

◆ **Applying Geographic Information System in the Land Resource Sector**

22–26 July 1996 Kuala Lumpur
26–30 August 1996
or 7–11 October 1996

Language: English Cost: US$560

This course, offered in three batches, will illustrate the concepts and functions of GIS applied in land resource management and demonstrate generic process for building integrated ARC-Info databases.

◆ **Inventory Data/Geographic Information System (GIS) Integration**

14–18 Oct 1996 Kuala Lumpur

Language: English Cost: US$ 750

The course will illustrate the concepts and functions of GIS.

◆ **GIS Application in Monitoring Plantation Forest**

11–15 November 1996 Kuala Lumpur
or 13–17 January 1997

Language: English Cost: US$ 750

This course, offered in two batches, will teach techniques of editing, managing, analysing and displaying geographical data. Discussions will include scale factors, resolution, coordinate systems and map projection.

◆ **Integration of Remote Sensing and GIS in Natural Resource Management**

23–28 September 1996 Kuala Lumpur

Language: English Cost: US$560

Comprehensive land cover mapping utilising existing GIS database and multi-temporal Landsat imagery.

For more information on these courses contact :

The Director, ASEAN Institute of Forest Management, Suite 903, IGB Plaza 6 Jalan Kampar 50400 Kuala Lumpur, Malaysia; Ph 603–442 9251 or 603–442 9252; Fax 603–442 5115; Email info@aifm.po.my

ITTO Tropical Forest Update

Editor: Alistair Sarre

Collaborating Editor: Johann G. Goldammer

Layout: Anne Watson

The *ITTO Tropical Forest Update* is published quarterly in three languages (English, French and Spanish) by the International Tropical Timber Organization. It is intended as a forum for information exchange on aspects of sustainable tropical forestry.

Please send **all correspondence** to:

The Editor, *ITTO Tropical Forest Update*, International Tropical Timber Organization Secretariat, International Organizations Center – 5th Floor, Pacifico-Yokohama, 1-1-1, Minato-Mirai, Nishi-ku, Yokohama 220, Japan. Ph 81–45–223 1110; Fax 81–45–223 1111; Email asarre@itto.or.jp

The contents of this newsletter do not necessarily reflect the views or policies of ITTO.

The editor invites **submission of articles** related to sustainable tropical forest management and trade for publication. People wishing to contribute articles should first submit a proposal to the editor to allow planning of future issues.

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Distribution: The *TFU* is currently distributed in three languages to over 6,700 individuals and organisations in 113 countries.

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Forthcoming Forestry/Environment Meetings

◆ 12–16 May 96. **Workshop on Ecological, Social and Political Issues in Certification of Forest Management**. Kuala Lumpur, Malaysia. Contact: Sandra Schinnerl, University of British Colombia; Fax 1–604–822 8645; Email sandra@unixg.ubc.ca, or Dr Nik Muhamad Majid, Universiti Pertanian Malaysia; Fax 603–942 2644; Email pnik@upmvmesa.ccrisc.upm.my.or

◆ 26–30 May 96. **Certification and Labelling of Sustainably Produced Forest Products**. Brisbane, Australia. Contact: Conference Secretariat, PO Box 505, Curtin ACT 2605, Australia; Ph 61–6–281 6624; Fax 61–6–285 1336.

◆ 10–13 June 96. **Modelling Regeneration Success and Early Growth of Forest Stands**. Copenhagen, Denmark. IUFRO S4.01–00. Contact: J. P. Skovsgaard, Danish Forest and Landscape Research Institute, Hørsholm Kongevej 11, DK–2970 Hørsholm, Denmark; Fax 45–45–76 3233.

◆ 10–14 June 96. **Symposium on Environmental Science and Technology.** Curitiba. Contact: Prof. Sylivio Péllico, Federal University of Parana State, Curitiba, Brazil; Fax 55–41–252 2332.

◆ 11–14 June 96. **Accelerating Native Forest Regeneration on Degraded Tropical Lands**. Washington, DC. Contact: Dr J. Parotta, USDA Forest Service, World Bank, AGRAF, 1818 H Street, NW, Washington DC, 20433, USA; Fax 1–202–522 3308; Email jparrotta@worldbank.org

◆ 17–20 June 96. **Conflict Management and Public Participation in Natural Resource Management**. Joensuu. Contact: Ms Saija Miina, European Forest Institute, Torikatu 34, FIN–80100 Joensuu, Finland; Fax 358–73–124 393; Email smiina@efi.joensuu.fi

◆ 23–29 June 96. **Non-Market Benefits of Forestry.** Edinburgh. Contact: Mrs Ann Alexander, Policy Studies Division, Forestry Commission, 231 Corstorphine Road, Edinburgh EH12 7AT, Scotland, UK; Fax 44–131–334 2819.

◆ 24–27 June 96. **2nd International Airborne Remote Sensing Conference and Exhibition: Technology, Measurements and Analysis**. San Francisco, USA. Contact: Robert Rogers, ERIM Conferences, Box 134001, Ann Arbor, MI 48113–4001 USA; Fax 1-313–994 5123; Email raeder@erim.org

◆ 1–6 July 96. **Plants for Food and Medicine**. London. Contact: The Linnean Society, Burlington House, Piccadilly, London W1V 0LQ, UK; Fax 44–171–287 9364; Email marquita@linnean.demon.co.uk

◆ 7–12 July 96. **Forest Products for Sustainable Forestry.** Pullman, USA. IUFRO Div. 5. Contact: WSU Conferences & Institutes. Ph 1–509–335 3530; Fax 1–509–335 0945; Email wsuconf@mail.wsu.edu

◆ 13–18 July 96. **5th ISSR Symposium on Root Demographics and their Efficiencies in Sustainable Agriculture, Grassland and Forestry Ecosystems.** Athens, USA. Contact: J. Box, USDA Agricultural Research Service, Conservation Research Center, 1429 Experimentation Station Rd, Watkinsville GA, USA; Fax 1–706–769 8962.

◆ 29 July–1 August 96. **Planning and Implementing Forest Operations to Achieve Sustainable Forests**. IUFRO S3.04-00 and Council on Forest Engineering. Contact: Mike Thompson, 1996 COFE Chairperson, USDA Forest Service, 410 MacInnes Drive, Houghton MI 49931–1199, USA; Fax 1–906–482 6355.

◆ 9–23 August 96. **Intergovernmental Seminar on Criteria and Indicators for Sustainable Forest Management**. Helsinki, Finland. Contact: Director Pekka Patosaari, Ministry of Agriculture and Forestry, Department of Forest Policy, PO Box 232, FIN–001710, Finland; Fax 358–0–160 2400.

◆ 14–15 August 96. **Course on Quality and Productivity in the Production of Raw Material Industrial Wood**. Curitiba. Contact: Prof. Roberto T. Hosokawa, Federal University of Parana State, Curitiba, Brazil; Fax 55–41–252 2332.

◆ 20–23 August 96. **International Workshop on Hypsipyla Shoot-Borers in Meliaceae**. Kandy, Sri Lanka. Contact: Ms Manon Griffiths, QDPI Forestry, PO Box 631, Indooroopilly, Qld 4068, Australia; Fax 61–7–3896 9628; Email griffith@qfslab.ind.dpi.qld.gov.au

◆ 2–6 September 96. **World Heritage Tropical Forests Conference.** Cairns, Australia. Contact: Conference Secretariat, PO Box 1280, Milton, Queensland 4064, Australia; Fax 61–7–3369 1512; Email whtf96@sunray.im.com.au

◆ 2–6 September 96. **Advances in Forest and Woodland History**. Nottingham. Contact: Dr Charles Watkins, Dept of Geography, University of Nottingham, NG7 2RD, UK; Fax 44–115–951 5249.

◆ 2–13 September 1996. **3rd Session of the Intergovernmental Panel on Forests**. Geneva, Switzerland. Contact: Director, Division of Sustainable Development, Department of Policy Coordination and Sustainable Development, United Nations Secretariat, New York, NY 10017, USA; Fax 1–212–963 1795.

◆ 8–13 September 96. **International Conference on Integrating Conservation of Biological Diversity with Social and Economic Goals.** Victoria. Contact: Connections Victoria Ltd., PO Box 40046, Victoria, BC V8W 3N3, Canada; Fax 1–604–382 2076.

◆ 11–13 September 96. **International Conference On Multiple Land Use And Catchment Management.** Aberdeen. Contact: Dr Sue Bird, Conference Administrator, MLURI, Craigiebuckler, Aberdeen AB9 2QJ, UK. Ph 44–1224–318611; Fax 44–1224–311556; Email S.Bird@mluri.sari.ac.uk

◆ 17–29 September 96. **2nd Seminar on Applied Remote Sensing and GIS for Forest Engineers**. Curitiba. Contact: Prof. Attilio A. Disperati, Federal University of Parana State, Curitiba, Brazil; Fax 55–41–252 2332.

◆ 23–27 September 96. **Effects of Environmental Factors on Tree and Stand Growth.** Dresden, Germany. IUFRO S4.01–00. Contact: Prof. Dr. Günter Wenk, Institut für Waldwachstum und Forstliche Informatik, Postfach 10, D–01735 Tharandt, Germany.

◆ 23–29 September 96. **Planning and Decision-Making for Sustainable Forest Uses.** Moscow, Russia. IUFRO SPDC and Divisions 4 and 6. Contact: Dr Max Krott, Universität Göttingen, Institute für Forstpolitik und Naturschutz, Büsgenweg 5, d–37077 Göttingen, Germany; Fax 49–551–399 629.

◆ 24–27 September 96. **3rd International Plywood and Tropical Timber Congress**. Belém, Brazil. Contact: Ivan Tomaselli, SPCP Engenharia de Projetos Ltda, Rua São Pedro, 489–Cabral, 80035–020, Curitiba, Brazil; Fax 55–41–252 5871.

◆ 6–12 October 96. **Nursery and Establishment Operations for Difficult Sites**. Solan. IUFRO S3.02–00, S3.02–03, S3.02–01. Contact: Dr Parvinder Kaushal, Region Centre, NAEB, Dr YS Parmar University of Horticulture and Forestry, Nauni–173 230, Solan (HP), India; Fax 91–1792–62242.

◆ 7–11 October 96. **Assessment of Biodiversity for Improved Forest Planning**. Monte Verità, Switzerland. IUFRO S4.02–00. Contact: Dr. Michael Köhl, Swiss Federal Institute for Forest, Snow and Landscape Research, CH–8903 Birmensdorf, Switzerland; Fax 41–1–739 2215; Email koehl@wsl.ch

◆ 20–22 October 96. **Workshop on Seed-borne Pathogens of Tree Seeds**. Prague, Czech Republic. Contact: Dr Jack Sutherland, Pacific Forestry Centre, 506 W Burnside, Victoria, BC V8S 2Z1, Canada; Fax 1–604–363 0775; Email jsutherland@al.pfc.forestry.ca

◆ 26–28 October 96. **Resource Inventory Techniques to Support Agroforestry Activity.** IUFRO S4.02–00. Palampur. Contact: Dr Atul, Head of Department of Agro forestry and Environment, HP Agriculture University, Palampur 176062, Dist. Kanga (HP), India; Fax 91–1894–30530.

◆ 27 October–2 November 96. **Tree Improvement for Sustainable Tropical Forestry.** Caloundra, Australia. Post-conference tour in North Queensland, 3–7 November. Contact: QFRI-IUFRO Conference, Queensland Forest Research Institute, MS 483, Gympie, Qld 4570, Australia; Fax 61–74–828 755; Email stevew@qfri.fh.dpi.qld.gov.au

◆ 4–15 November 96. **3rd Conference of the Parties to the Convention on Biological Diversity**. Buenos Aires, Argentina. Contact: Secretariat, Convention on Biological Diversity, World Trade Centre, 413 St. Jacques St, Office 630, Montreal, Canada; Ph 1–514–288 2220; Fax 1–514–288 6588.

ITTO Calendar

◆ 15–23 May 96. **XX Session of the ITTC & XVIII Sessions of the Permanent Committees.** Manila, Philippines.

◆ 24–26 May 96. **International Conference on Community Forestry: As a Strategy Towards Sustainable Forest Management**. Manila. ITTO Project PD28/95(F). Contact: Mr Jose D. Malvas, Jr, Director, Forest Management Bureau, DENR, Manila, Philippines. Ph 63–2–927 4788; Fax 63–2–920 0374/926 2141.

◆ 13–20 November 96. **XXI Session of the ITTC & XIX Sessions of the Permanent Committees.** Yokohama, Japan.

◆ 21–30 May 97. **XXII Session of the ITTC & XX Sessions of the Permanent Committees.** La Paz, Bolivia.

◆ 4–6 November 96. **International Symposium on Forest and Environment.** Nanjing. Contact: Mr. Li Rongsheng, Secretariat, ISFE, Nanjing Forestry University, Nanjing 210037, P.R. China; Fax 86–25–541 2500.

◆ 4–7 November 96. **International Symposium on Assessment and Monitoring of Forests in Tropical Dry Regions with Special Reference to Gallery Forests.** Brasilia. IUFRO S4.02–00. Contact: Prof. Dr. Jose Imana, Universidade de Brasilia, Departamento de Engenharia Florestal, 70.910–900, Brasilia DF, Brazil; Fax 55–61–347 0631; Email imana@guarany.cdp.unb.br

◆ 4–7 November 96. **Eco-Informa '96: Global Networks for Environmental Information**. Florida, USA. Contact: ERIM/Eco-Informa, PO Box 134001, Ann Arbor MI 48113–4001, USA; Ph 1–313–994 1200 ext 3234; Fax 1–313–994 5123; Email wallman@erim.org

◆ 18–24 November 96. **Expomaderas '96 (Feria Internacional de la Industria de las Madera, Maguinaria y Afines)**. Lima, Peru. Contact: Jessica Moscoso, Confederación de la Madera, Av. Mariscal O. Benavides (Diagonal) 550, Of. 501, Lima 18, Peru; Ph/Fax 51–1–446 7563.

◆ 24–27 November 96. **Australia's Ever-Changing Forests III: 3rd National Conference on Australia's Forest History**. Jervis Bay, Australia. Contact: Dr J. Dargavel (Australian Forest History Society), URP, Research School of Social Sciences, Australian National University, Canberra ACT 0200, Australia; Fax 61–6–249 0312; Email John.Dargavel@anu.edu.au

◆ 25–29 November 96. **Tropical Forestry in the 21st Century (How to Gather, Evaluate and Use Ethnobiological Data).** Bangkok. IUFRO S4.02–00. Contact: FORTROP '96 Secretariat, Faculty of Forestry, Kasetsart University, PO Box 1054, Bangkok, Thailand 10903; Fax 66–2–561 4246; Email fforskt@nontri.ku.ac.th

◆ 3–6 December 96. **Biodiversity, Conservation and Management at the Beni Biosphere Reserve**. La Paz. Contact: Carmen Miranda, Academia Nacional de Ciencias de Bolivia, Av. 16 de Julio 1732, Casilla 5829, La Paz, Bolivia; Fax 591–2–350 612; Email cMiranda@ebb.bo

◆ 25 February–1 March 1997. **1997 International Symposium on Human Dimensions of Natural Resource Management in the Americas**. Belize City, Belize. Contact: Jennifer Pate, Symposium Coordinator, Human Dimensions in Natural Resources Unit, College of Natural Resources, Colorado State University, Ft. Collins CO 80523, USA; Fax 1–970–491 2255; Email jpate@cnr.colostate.edu

◆ 12–17 May 97. **Forestry in a Changing Political Environment: Challenges for the 21st Century.** Victoria Falls, Zimbabwe. Contact: The Secretary General, the 15th Commonwealth Forestry Conference, Forestry Commission, PO Box HG 139, Highlands, Harare, Zimbabwe; Ph 263–14–49 8430; Fax 263–14–49 7066.

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

INFORMATION NETWORK

Information Search Facility Offered

The ITTO Information Network provides a literature search and retrieval service for individuals and organisations active in tropical forest research and management. This service is only available to people living and working in the tropics.

1. **Literature Search:** We use the 'CAB Abstracts' computerised information base to do literature searches for you. CAB Abstracts on CD Rom contains a large number of scientific references in the field of biological science (including forestry, forest products and agroforestry) for the years 1984-1992. To obtain the best results, make sure that the information you provide (such as keywords) is as precise as possible. You will receive a printout which gives the author, title, date and abstract of the articles, and the name of the journal or book in which they appear. Please check your local library first in case it offers a similar facility.

   Note: All searches of this nature are likely to be incomplete. We suggest that you expand your reference list from the literature cited in the articles themselves.

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