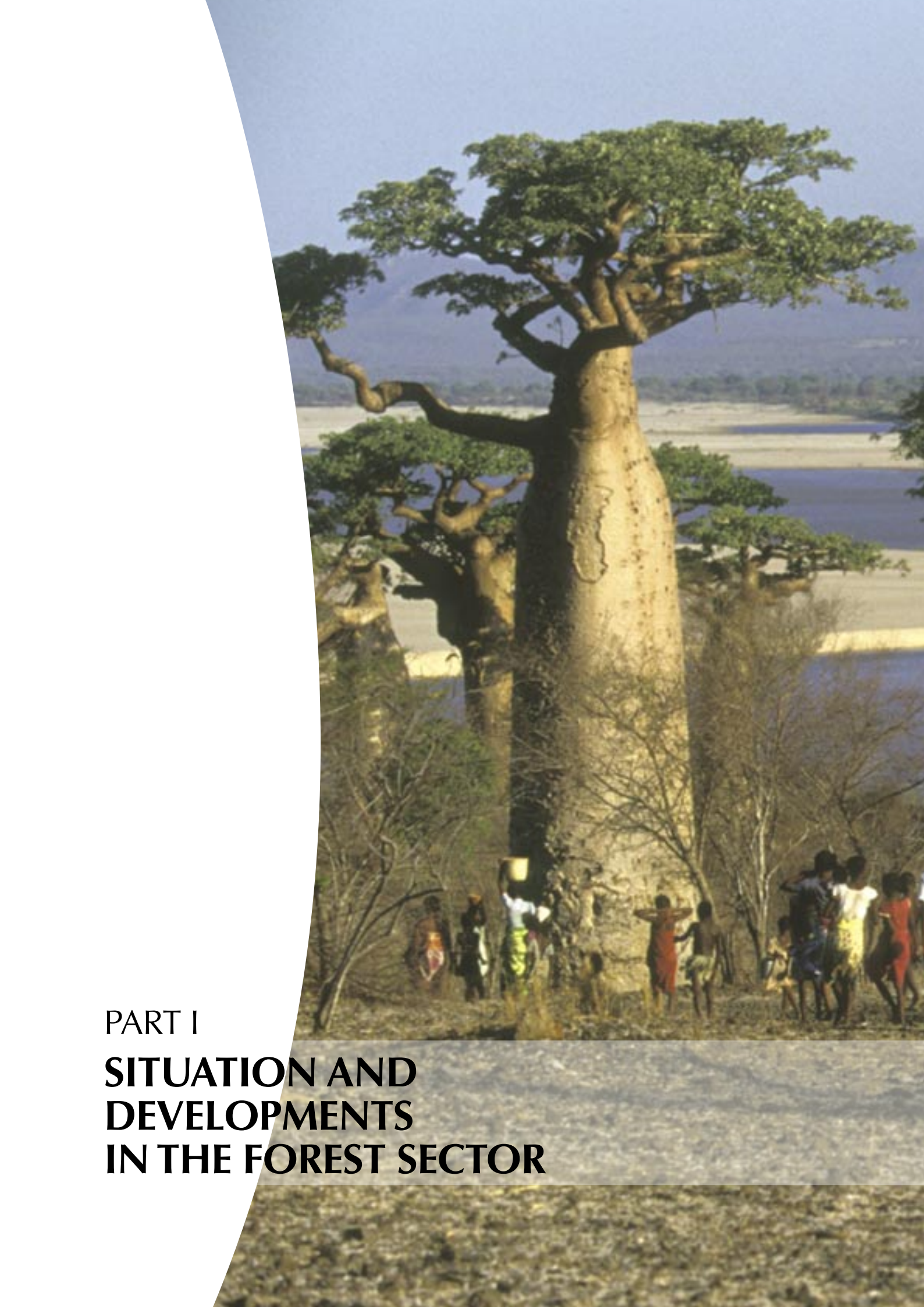


PART I

SITUATION AND DEVELOPMENTS IN THE FOREST SECTOR

Forest resources

The last Global Forest Resources Assessment (FRA) was conducted in 2000 (FAO, 2001), and the next comprehensive assessment is expected in 2010. In line with previous interim assessments in 1995 and 1988, an update is under way for 2005 (FRA 2005) and is expected to be released later in the year. This chapter highlights the structure of the main report of FRA 2005, noting that independent studies on key global issues related to the extent and condition of forest resources will be included. The chapter also outlines reporting requirements under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol; underscores the importance of secondary forests in tropical regions; describes the challenges and opportunities associated with sustainable forest management in small island developing states (SIDS); provides an overview of new sources of raw material and substitutes for wood fibre in Asia; and presents the latest results of an ongoing FAO study on international trade in non-wood forest products (NWFPs).

GLOBAL FOREST RESOURCES ASSESSMENT UPDATE 2005

FRA 2005 focuses on key trends and builds on the thematic elements of sustainable forest management, drawn from regional and ecoregional criteria and indicators processes, as a reporting framework (see Box on page 3). Thus, the information collated in the assessment is relevant to national monitoring of progress towards sustainable forest management and reporting to various forest-related international organizations and processes.

FRA 2005 continues the FAO tradition of reporting on the world's forests. The periodic global assessment reports have tracked and reflected the changes that both the resource and forestry have undergone over the past 50 years. For example, for decades following the Second World War, timber supply dominated international forestry issues. Consequently, global assessments focused on the capacity of forests to yield sufficient amounts of wood in a sustainable manner. As issues related to development and the environment emerged, FRA 1980 was the first to report on deforestation and forest degradation. In 1992, the United Nations Conference on Environment and Development (UNCED) outcomes added biological diversity, climate change and desertification to the agenda. With more recent emphasis on rural livelihoods, benefit sharing, food security and how forests contribute to achieving these goals, FAO has expanded FRA reports to include social and environmental dimensions of the resource.

As coverage evolved and grew, so did the extent to which countries participated in the process. In the largest FRA gathering ever, national correspondents from 120 countries met in Rome in November 2003 to discuss issues related to the Global Forest Resources Assessment and to finalize the design of FRA 2005. Regional meetings of focal points were held throughout 2004 to support national input to global statistical tables, using agreed terms and definitions. This type of partnership has helped to make FRA widely known and accepted. In addition to enhancing the transparency of the process, regular communication and targeted assistance facilitate the documentation of methodologies and the processing of data based on information from official national sources. As a result, the FRA reports are widely acknowledged as providing the most accurate global estimates available.

The core of FRA 2005 is a set of 15 tables that are related to the thematic elements of sustainable forest management, with common terms and definitions for all countries to use (Table 1). Requests for data covering 1990, 2000 and 2005 focus on trends rather than status. The

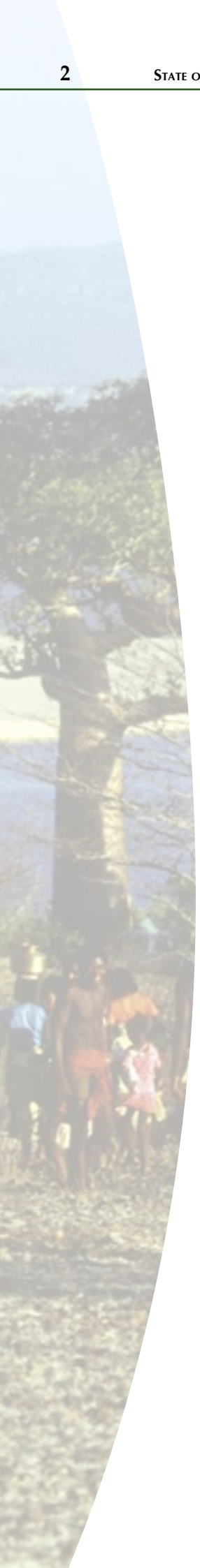


TABLE 1

National reporting tables in FRA 2005 and links to common thematic elements of sustainable forest management

National reporting table	Extent of forest resources	Forest health and vitality	Biological diversity	Productive functions of forest resources	Protective functions of forest resources	Socio-economic functions
Extent of forest	■		■	■		
Forest ownership	■					■
Designated functions of forest			■	■	■	■
Forest characteristics	■	■	■		■	■
Growing stock	■		■	■		■
Biomass stock	■		■	■		■
Carbon stock	■			■		■
Disturbances affecting health and vitality	■	■		■	■	■
Diversity of tree species	■		■	■		■
Growing stock composition	■		■	■		■
Wood removal	■			■		■
Value of wood removal				■		■
Removal of non-wood forest products	■		■	■		■
Value of non-wood forest products				■		■
Employment in forestry						■

Note: "Forest" refers to forest and other wooded land.

exercise provides an opportunity to update data reported for 1990 and 2000 and to extend the time series to determine possible recent shifts.

Many countries are voicing concerns over the number and complexity of requests for forest-related information from international processes. They have asked for greater harmonization of efforts and for a reduction in the reporting burden. FRA 2005 has taken these concerns into account. For example, requests for data on forest biomass and carbon are consistent with information required by UNFCCC; information on threatened species is based on World Conservation Union (IUCN) classifications; employment data draw from the International Labour Organization (ILO) definitions; and information on removals is linked to reporting on forest products and trade.

While the country information in the 15 tables provides the basis for global and regional trend analysis, these tables alone cannot fully describe national status and trends in forestry because of varying ecological, social and economic conditions. For this reason, FRA 2005 encourages countries to provide additional information on each of the common thematic elements of sustainable forest management through optional reporting. Many countries already prepare such reports for national purposes, and many developing countries use the opportunity provided by this request to work on broader national reports on sustainable forest management within the framework of the global assessment.

For each country report, documentation and background data pertinent to estimates will be archived as working papers for future reference. In addition, FRA 2005 will contain independent studies on key global issues related to the extent and condition of forest resources, including forests and water, planted forests, mangroves and forest fires.

The process of compiling a national report is an opportunity to collate information on

Criteria and indicators for sustainable forest management

The usefulness of criteria and indicators as tools to monitor and assess forest conditions and trends is recognized worldwide. They continue to increase understanding of sustainable forest management by generating better information; improve the development and implementation of forest policies, programmes and practices; strengthen stakeholder involvement in decision-making; and enhance collaboration on forest issues at the local, national, regional and international levels.

Nearly 150 countries, containing 97.5 percent of the world's forest area (FAO, 2003a), are participating in nine regional and international criteria and indicators processes.[1] As might be expected with such extensive coverage, the degree of implementation varies considerably among processes and among member countries within them.

The International Conference on the Contribution of Criteria and Indicators for Sustainable Forest Management: the Way Forward (CICI 2003) took place in Guatemala City, Guatemala, in February 2003 (FAO, 2003b). Experts underscored the contribution of sustainable forest management towards wider sustainable development and highlighted the importance of criteria and indicators in monitoring and measuring progress in achieving associated goals over time.

Drawing on the criteria of the nine processes, CICI 2003 acknowledged that sustainable forest management comprises seven common thematic elements:

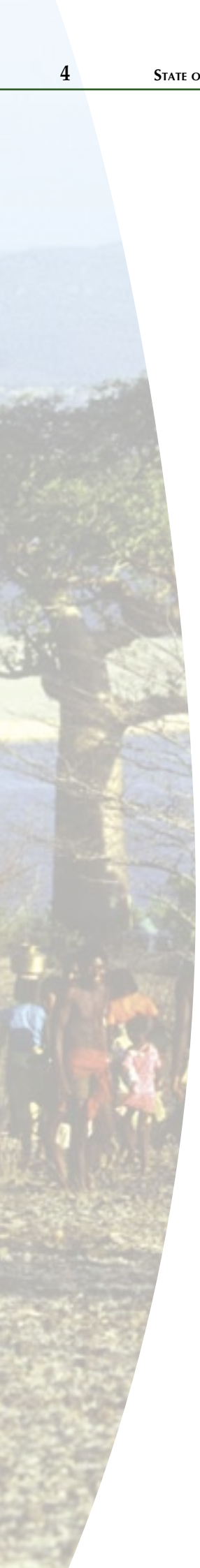
- extent of forest resources;
- biological diversity;
- forest health and vitality;
- productive functions of forest resources;
- protective functions of forest resources;
- socio-economic functions;
- legal, policy and institutional framework.

In March 2003, the sixteenth session of the FAO Committee on Forestry (COFO) took note of this development, and less than one year later the FAO/International Tropical Timber Organization (ITTO) Expert Consultation on Criteria and Indicators for Sustainable Forest Management, held in Cebu City, Philippines, recognized the potential for these elements to facilitate communication on forest issues internationally. Delegates at the fourth session of the United Nations Forum on Forests (UNFF) in May 2004 also acknowledged that the seven elements offer a reference framework for sustainable forest management (see page 58).

From a practical perspective, FRA 2005 is building on the common thematic elements of sustainable forest management as a reporting framework, and the Collaborative Partnership on Forests (CPF) is using them as a basis for developing an information framework for forest reporting (see page 59).

[1] The African Timber Organization (ATO) Process, the Dry Forest in Asia Process, the Dry-Zone Africa Process, the International Tropical Timber Organization (ITTO) Process, the Lepaterique Process of Central America, the Montreal Process, the Near East Process, the Pan-European Forest Process and the Tarapoto Proposal for the Sustainability of the Amazon Forest.

several important indicators for better decision-making and to illustrate progress towards sustainable forest management at the national level. Besides a number of other uses, the periodic FRA reports serve as references to those involved in national forest programmes, forest outlook studies and the preparation of reports to intergovernmental processes on forests and sustainable development. Finally, FRA findings form a significant input into reports on progress in achieving the United Nations Millennium Development Goals.



Further information on FRA is available at www.fao.org/forestry/fra.

NEW GUIDANCE FOR ESTIMATING CARBON STOCK CHANGES IN FORESTS

The scope, techniques and importance of forest inventories worldwide may change as a result of developments in the international dialogue on climate change. First, all Parties to UNFCCC must estimate and report carbon stock changes in their forests under the convention's rules. Developed countries report annually, developing nations periodically. Second, the Kyoto Protocol establishes additional rules to monitor and account for carbon stocks. Developed countries (and the European Community) that have ratified the protocol must supplement their reporting under UNFCCC with disaggregated and more precise estimates for each year of the commitment period. By the end of 2006, these countries must also put in place an inventory system to record carbon removals and emissions, including those from forests. Finally, under the special provisions for sequestration projects of Joint Implementation or the Clean Development Mechanism (CDM) of the Kyoto Protocol, carbon in forestry projects must be monitored in order to realize credits. Thus, developed countries wishing to offset national emissions with carbon credits gained in their forests must periodically measure forest carbon to benefit from its market value. Partners involved in forestry sequestration projects must do likewise.

After two years of work involving about 120 experts, the Intergovernmental Panel on Climate Change (IPCC) delivered its Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG). The report (IPCC, 2004) defines inventory and calculation methods that reduce uncertainties as far as possible and neither overestimate nor underestimate carbon stock changes. Although Parties have so far hedged on whether and how to account for carbon in harvested wood products, the GPG outlines methods for assessing this potentially large carbon store as well.

The GPG combines two basic methods for estimating stock changes in the carbon pools of forest ecosystems and uses a progressively sophisticated three-tier system for calculations. Tier 1 acknowledges the lack of specific national data in many countries and employs simple methods, aggregated figures (e.g. one deforestation rate that covers all forest ecosystems in a country) and rough default values (e.g. the average carbon sequestration rate per hectare of all forests). Such values are offered in appendixes of the GPG and are often based on FAO statistics. Tier 3 uses country-specific data and less aggregated activities and may use computer modelling. Tier 2 is a combination of Tiers 1 and 3. Under UNFCCC rules, all carbon pools – living biomass above and below ground, dead wood, litter and soil organic matter – must be assessed. However, for reasons of practicability and efficiency, the GPG allows pools to be treated with variable intensity. Carbon pools that are key contributors to emissions should be assessed with Tier 2 or 3 methods, while Tier 1 suffices for less significant categories.

Under stricter rules for carbon monitoring in the Kyoto Protocol, developed countries may omit a certain carbon pool from national accounting after providing transparent and verifiable information that it is not a source of carbon emissions. Participants in forestry projects under the CDM may also forego possible credits by choosing to disregard carbon pools that are difficult to measure, for example soil or dead wood, as long as there is proof that these pools will not release carbon during the crediting period.

The GPG prescribes two basic methods for assessing carbon stock changes – the default method and the stock change method – each requiring more effort, resources and data and increasing in reliability the higher the tier chosen.

The default method estimates carbon change based on the difference between periodic carbon gains and periodic carbon losses. Gain is defined as the product of growing stock increment, wood density, biomass expansion factor, root–shoot ratio and biomass carbon fraction. Loss represents the sum of fellings, fuelwood

gathering and natural calamities all expressed as biomass and carbon via appropriate expansion factors. The stock change method estimates carbon change based on the difference in biomass stocks between two periodic inventories where biomass, at each point in time, is the product of growing stock, wood density, biomass expansion factor, root–shoot ratio and biomass carbon fraction.

Carrying out inventories according to the GPG by either method may be a formidable task for developed countries, given that some of the data and parameters for higher tiers may not be reliable. Gaps include actual increment, losses from harvest and calamities, specific biomass expansion factors, fellings, removals and root–shoot ratios. Monitoring carbon accumulation in sequestration projects will also necessitate new knowledge, and may markedly increase transaction costs, particularly for smallholders and community forestry projects. Parties to UNFCCC have realized this and are working on simplifying rules for these smaller initiatives.

In many developing countries, where emissions from industry are relatively minor, deforestation and forest harvesting are likely to represent a key source of greenhouse gases reported under UNFCCC. In Africa, for example, land-use change – essentially deforestation – contributes approximately 70 percent of emissions. However, basic information such as forest area can be highly questionable as more than half of developing countries that reported for FRA 2000 based their inventories on estimates rather than on ground sampling or aerial surveys. Only 2 percent of countries conducted more than one national forest inventory, and not one could report forest increment. Hence, data in these countries for both the default and stock change methods are either uncertain or missing altogether, so that calculations of carbon stock changes in forests using default values are likely to have a large margin of error.

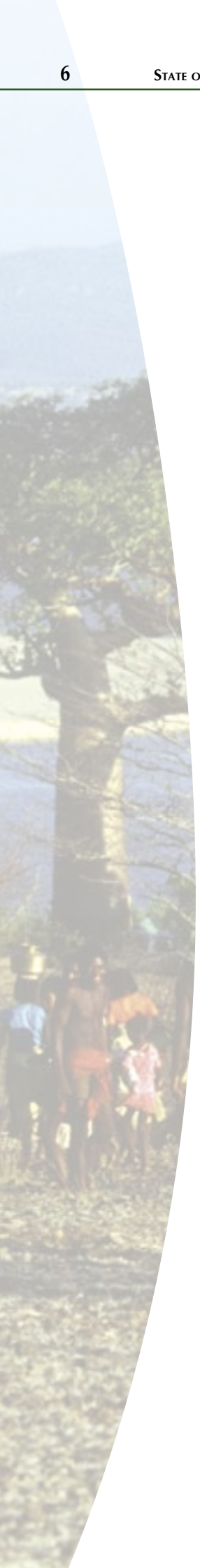
National forest resources assessments have long been recognized as essential tools for forest policy and national development. However, global climate change, obligations under UNFCCC and the Kyoto Protocol, and the GPG add to the need to close information gaps and to improve the frequency, accuracy and quality of such assessments. For countries to benefit economically from the carbon services provided by forests and for them to comply with new reporting obligations, concerted research efforts, along with intensified and adapted forest inventory techniques, may be necessary. In this respect, the FAO programme to support national forest assessments and the process being used to update FRA help build country capacity to generate additional information to meet current and emerging needs.

SECONDARY FORESTS IN TROPICAL REGIONS

Secondary forests are defined as "forests regenerating largely through natural processes after significant disturbance (human and natural) of the original forest vegetation at a single point in time or over an extended period, and displaying a major difference in forest structure and/or canopy species composition with respect to nearby primary forests on similar sites" (FAO, 2003c).

Areas of secondary forest throughout the tropics are increasing dramatically, and in many tropical countries they now exceed areas covered by primary forest. Most of these secondary forests develop following the disturbance or elimination of natural forests by slash-and-burn practices, conversion to agricultural activities and subsequent abandonment of lands or following excessive logging operations that have reduced the original forest to a non-commercial resource. In both cases, seeds from surrounding trees have led to eventual regeneration of the forest.

Although figures vary according to the definition used, the extent of degraded forests and secondary forests in tropical Africa, America and Asia in 2002 was estimated at 245 million, 335 million and 270 million hectares, respectively, for a total 850 million hectares (ITTO, 2002). According to FAO (2001), the reported loss of natural forests in the tropics during the 1990s was approximately 15.2 million hectares annually, of which 90 percent or more was converted to other land uses. These



estimates indicate that the potential future area of secondary forests could be considerable.

To some people, the term secondary forests may imply that they are less important than primary forests. However, they provide a wide array of goods and services to society, especially to local communities that depend on this resource (see Box below). Secondary forests remain undervalued and underused for their capacity to reduce poverty, enhance food security and provide environmental services. In part, this is because foresters and decision-makers do not sufficiently highlight their importance. Lack of knowledge on how to manage this resource sustainably is also a constraint.

More information is needed on the status and extent of secondary forests and on management options. To obtain it, agreement must be reached on a common definition and on which forest types to include. In addition, experiences in managing this resource need to be documented, shared and widely distributed for further possible use and adaptation. Their contribution to the livelihoods of rural communities and national development goals also has to be acknowledged.

Currently, secondary forests *per se* are not prioritized or addressed in national forest programmes, national development strategies or forest inventories. This omission has often led to their undervaluation and their conversion to planted forests or other land uses such as agriculture. As in the case of primary forests, overexploitation has led to the degradation of secondary forests, making them prone to colonization by invasive species. The cost of restoring these degraded forests is high, and the process is slow as well as difficult.

For the past few years, a number of international and regional organizations such as the Tropical Agricultural Research and Higher Education Center (CATIE), the Center for International Forestry Research (CIFOR), the World Agroforestry Centre (ICRAF), the International Tropical Timber Organization (ITTO) and FAO, in collaboration with the donor community, have been raising awareness of the importance of secondary forests and are working to improve management practices. As part of these efforts, regional workshops were organized in Latin America (Peru, June 1997), Asia (Indonesia, November 1997 and April 2000) and Africa (Kenya, December 2002 and Cameroon, November 2003). Discussions highlighted lessons learned. In addition, participants drew a number of conclusions and made several recommendations.

- As with primary forests, secondary forests are a good source of wood fibre, NWFPs, social and environmental services and other goods.

Products, goods and services from secondary forests

Secondary forests:

- provide environmental services such as regulation of water flow and quality, erosion control and carbon sequestration;
- are used in agricultural systems to restore nutrients and soil properties, to prevent pests and diseases and to regulate microclimate, which may be beneficial for the establishment of certain species (e.g. shade for intercropping with coffee and cocoa);
- provide many NWFPs (e.g. medicines, fruits, grains, game and bushmeat, bamboo and rattans) which are more readily harvested from secondary forests because of their relative accessibility;
- provide wood products such as timber, construction wood, fuelwood and charcoal;
- contribute to biodiversity conservation by relieving pressure on primary forests, by functioning as corridors for the migration of flora and fauna in fragmented landscapes and by maintaining plant and animal genetic resources.

- Forest policy and legislation should take into account that requirements for secondary forests differ from those of primary forests and need to be identified, highlighted and addressed separately.
- Appropriate management options that take into account the needs of people who depend on this resource for their livelihoods need to be identified and implemented.
- Successes and lessons related to the sustainable management of secondary forests need to be widely publicized. Those involved should exchange information and experiences on policy development and implementation and on social, economic, ecological and technical management aspects.
- Countries should catalogue and assess secondary forests and their typologies, and efforts should be made to recognize fully their contribution to local, regional and national economies.
- Secondary forests should feature prominently on the international political agenda, in national policies and in national forest programmes. They should be managed as an integral part of land use, and their contributions should be highlighted in poverty reduction strategies.

FORESTS AND TREES IN SMALL ISLAND DEVELOPING STATES

In January 2005, Mauritius hosted the International Meeting for the Ten-Year Review of the Barbados Programme of Action on Small Island Developing States. Participants assessed progress in implementing the programme, reinforced commitments and further explored ways forward, including those regarding forestry issues, which formed part of the programme's chapter on land resources.

Despite the lack of an agreed definition of a small island developing state, the establishment in 1991 of the Alliance of Small Island States (AOSIS) gave SIDS an international political identity. AOSIS has 39 member countries, including four low-lying coastal states – Belize, Guinea-Bissau, Guyana and Suriname – and four dependent territories as observers. FAO statistics for SIDS also include Bahrain and the Dominican Republic, which are members of FAO but not of AOSIS, bringing the total number to 41 (Table 2).

TABLE 2

Countries considered small island developing states in FAO reporting as of September 2002

Africa
Cape Verde
Comoros
Guinea-Bissau
Mauritius
Sao Tome and Principe
Seychelles

Asia
Bahrain[a]
Cyprus
Maldives
Singapore[b]

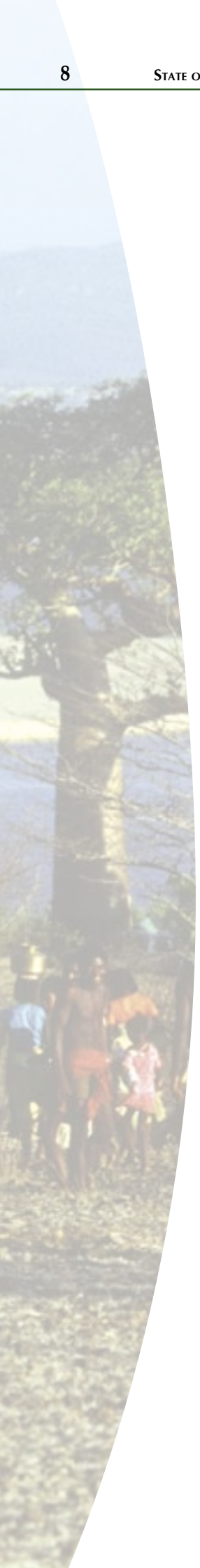
Europe
Malta

North and Central America
Antigua and Barbuda
Bahamas
Barbados
Belize
Cuba
Dominica
Dominican Republic[a]
Grenada
Haiti
Jamaica
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Trinidad and Tobago

Oceania
Cook Islands
Federated States of Micronesia
Fiji
Kiribati
Marshall Islands
Nauru
Niue
Palau
Papua New Guinea
Samoa
Solomon Islands
Tonga
Tuvalu
Vanuatu

South America
Guyana
Suriname

[a] Not a member of AOSIS.
[b] Not a member of FAO.



Forest resources

Forests in SIDS cover an estimated 75 million hectares, or 63 percent of combined land area (FAO, 2002), but the extent of forest cover differs greatly among islands. For example, the forest cover of the Bahamas, the Cook Islands, Palau, Solomon Islands and two low-lying coastal states (Guyana and Suriname) ranges from 76 to 96 percent of total land area. Conversely, 11 of the 41 SIDS (Bahrain, Barbados, the Comoros, Haiti, Maldives, Malta, the Marshall Islands, Mauritius, Nauru, Singapore and Tonga) have forest cover of less than 10 percent, and some of these have less than 1 percent. No data are available for Tuvalu. The combined forest cover of island states with a land area of less than 50 000 km^2 (i.e. excluding the low-lying coastal states, Cuba and Papua New Guinea) was estimated at 38.4 percent of total land area in 2000, compared with the world average of 29.6 percent.

Although deforestation appears to have slowed in the past decade, the average annual rate is still high in many SIDS. Of the ten countries with the highest annual deforestation rates between 1990 and 2000, four are SIDS (the Comoros, the Federated States of Micronesia, Haiti and Saint Lucia). The main causes include conversion of forested land for agriculture and for infrastructure such as roads, ports, housing and tourism development. On the other hand, Bahrain, Cape Verde, Cuba, Cyprus, Grenada and Vanuatu registered an increase in forest cover from 1990 to 2000, mainly because of afforestation. Table 3 shows the change in forest cover in the 41 island states and worldwide between 1990 and 2000.

While the total forest cover represents less than 1 percent of the world's forest area, these forests and trees are essential locally because they enhance food security, in part by protecting marine and coastal environments, and regulate the quantity and quality of water supplies. In addition, forest resources on several islands are important globally in terms of biodiversity conservation. For most of the larger islands, forests also contribute significantly to the national economy.

Challenges to sustainable forest management

Small island countries vary a great deal according to geographic, ecological, political, social, cultural and economic characteristics, but many share similar constraints to the sustainable conservation and use of their forest resources:

- limited land area and high population pressure particularly in lowland and coastal areas;
- vulnerability to environmental disasters and climate change, including rising sea levels associated with global warming;

TABLE 3

Forest cover in small island developing states, by region, 1990 and 2000

Region	Total forest ('000 ha)		Annual change 1990–2000	
	1990	2000	'000 ha	%
Africa	2 524	2 353	-17	-0.70
Asia	122	175	5	3.67
Europe	n.s.	n.s.	n.s.	n.s.
North and Central America	6 902	6 667	-24	-0.35
Oceania	35 832	34 614	-122	-0.35
South America	31 478	30 992	-49	-0.16
All 41 SIDS	76 858	74 801	-206	-0.27
SIDS <50 000 km^2	7 472	7 325	-15	-0.20

Note: n.s. = not significant.
Source: FAO, 2002.

FORESTRY DEPARTMENT, JAMAICA

Small island developing states face a variety of challenges to forestry and sustainable forest management, including scarcity and inaccessibility of land. In Jamaica, where scattered timber trees are a feature of farm landscapes, the Forestry Department has engaged local communities in participatory forest management and provided training in appropriate silvicultural techniques

- high species endemism and high risk for loss of biological diversity because of small population sizes;
- alien species that are difficult to control;
- small tracts of forest over vast areas and in geographic isolation resulting in high costs for public administration and infrastructure (including transport and communications), small internal markets, limited export volumes and reduced competitiveness;
- weak institutional capacity;
- insecure land tenure and absentee landowners;
- lack of integrated land-use planning.

Opportunities and future prospects

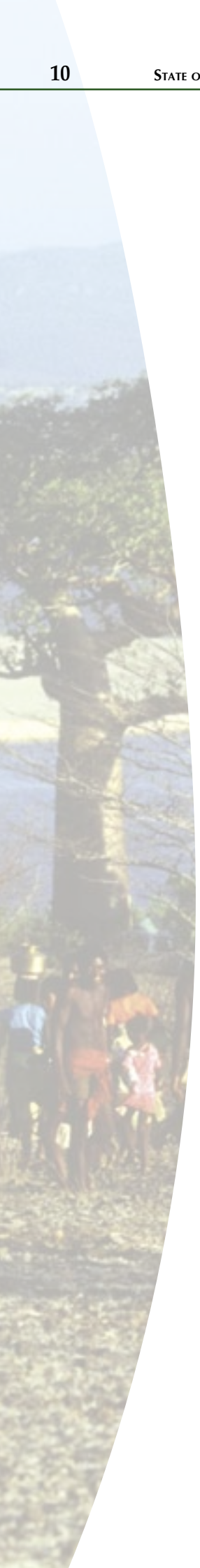
Although many of the larger SIDS are well endowed with forests, not all forests are accessible, and harvesting of commercial species has already reached unsustainable levels in many places. Future increases in wood production will depend on more countries' adopting sound harvesting practices and applying appropriate silvicultural techniques. Additional production from planted forests is possible in larger SIDS, but scarce land restricts the potential for large-scale operations in many of these countries. Lack of good soils is also a problem, particularly in SIDS that are coral based. Agroforestry systems with coconut as the main wood-like resource seem to hold the most promise for atolls with low soil fertility and for smaller islands where land is limited.

Value-added wood processing, in particular of local hardwoods, offers good prospects for diversification in SIDS that are well endowed with forests. Diversification is also possible in terms of NWFPs where niche markets are present or can be developed, and in terms of bioprospecting, given that many SIDS have unique genetic resources.

Tourism is a key industry in many SIDS and, with interest in ecotourism and nature tourism on the rise (see page 27), forests may well contribute to growth in the sector. Efforts to develop the industry will need to be made in the context of an integrated plan that takes into account social, cultural and environmental dimensions.

Considerable potential also exists to develop markets for environmental services, coupled with mechanisms to compensate resource owners for their provision.

The varied and important roles of forests and trees in SIDS call for holistic and integrated approaches to their sustainable management, which should take into account not only the direct benefits that they provide, but also their links with other natural ecosystems and sectors such as tourism. Although SIDS are diverse and spread around the globe, they share many constraints and prospects. The extent to which they can overcome limitations and capitalize on emerging opportunities depends on political will (including at the community level), regional collaboration and international support – not least in terms of



disaster reduction strategies and assistance when calamities strike.

ASIA'S NEW WOODS AND FIBRES

Plantations of agricultural and industrial crops such as rubber, coconut, bamboo and oil-palm are providing new sources of raw materials for forest industries in Asia. In addition, agricultural residues are important substitutes for wood fibre. Several of these "new woods and fibres" are being used to manufacture traditional and new forest products in Asia.

Rubberwood

Rubberwood (*Hevea brasiliensis*) has been planted throughout Southeast Asia during the past century for the production of latex. Plantations now cover an estimated 9 million hectares, making it the most widely planted tree species in Asia (FAO, 2001) (see Table 4).

Rubberwood was introduced into markets in the late 1970s after developments in seasoning and preservative treatments improved its feasibility as a utility timber. For the past decade, it has been an important raw material in the mix of Southeast Asian wood products, particularly for those destined for export.

The viable rubberwood harvest in Southeast Asia is estimated to exceed 6.5 million cubic metres per year (Balsiger, Bahdon and Whiteman, 2000). Most is processed into sawnwood and further into furniture. As a medium-dense hardwood with light colour, easy machining and good staining properties, rubberwood can be a substitute for many species, including ramin (*Gonystylus* spp.), meranti (*Shorea* spp.), teak (*Tectona grandis*), oak (*Quercus* spp.) and pine (*Pinus* spp.). It is increasingly being used in particle board, plywood, cement board and medium-density fibreboard, and trials are being conducted for use in oriented strandboard. Rubberwood accounts for more than 80 percent of Malaysia's furniture output, and exports of rubberwood products are valued at about US$1.1 billion. Thailand also has a large rubberwood furniture industry, with exports totalling more than US$300 million annually.

Coconut

The coconut palm (*Cocos nucifera*) is an agricultural crop throughout Asia and the South Pacific. Copra, from which coconut oil is derived, is the primary harvest. Of the more than 10 million hectares of coconut plantations in Asia, at least 2.1 million hectares are more than 60 years old, the age at which copra yields decline (Killmann, 2001).

Botanically, the coconut palm belongs to the monocotyledons, so its fibres are not classified as wood. When special processing and grading techniques are applied, parts of the stems of old coconut palms of the tall varieties can be used as a wood substitute (Killmann and Fink, 1996). At present, coconut sawing is mainly on a small scale, although volumes are significant. Timber is usually cut to meet local needs, mostly replacing timber from tree species traditionally used in rural houses and bridges. Commercial processing of coconut wood began in the 1970s in the Philippines for construction, pallets, stairs, windows and doorposts, tool handles, flooring and power poles. While coconut lumber is still mostly sold in domestic markets, specialty products such as decorative wall panelling,

TABLE 4

Areas of major woody agricultural plantation crops in Asia *('000 ha)*

Crop	Indonesia	Malaysia	Philippines	Thailand	Others	Total
Rubberwood (1997)	3 516	1 635	88	1 966	1 705	8 910
Coconut (1997)	3 760	270	3 314	377	2 593	10 314
Oil-palm (1999)	1 807	3 313	n/a	155	35	5 310
Total	**9 083**	**5 218**	**3 402**	**2 498**	**4 333**	**24 534**

Note: n/a = not available.
Source: Killmann, 2001.

parquet and blockboard are finding their way into niche markets.

Coconut wood is also used for non-construction purposes. New technologies enable its processing into a range of products, including cabinets and crafts such as jewellery boxes, cups, vases, plates and bowls (Arancon, 1997).

Oil-palm

In recent years, strong demand and high prices for palm oil and palm kernel have stimulated a boom in planting of oil-palm (*Elaeis guineensis*) in Asia to make foods, soaps and cosmetics. Plantations in Asia covered more than 5.3 million hectares in 1999 (Killmann, 2001) (Table 4).

At the time of felling, oil-palms produce an average of 235 cubic metres of stem material per hectare. This means that approximately 50 million cubic metres of residue will be generated each year in Asia over the coming decades, depending on the rate of replanting, which is often influenced by incentives and market prices for palm oil. In addition, as much as 100 million tonnes of palm fronds, 20 million tonnes of empty fruit bunches and 5 million tonnes of palm kernel shells are produced annually as by-products and could be available for processing.

The physical and mechanical properties of oil-palm stems, like those of coconut palm stems, vary considerably over cross-section and height. The low recovery rate and high moisture content result in considerable transport and seasoning costs (Killmann and Woon, 1990) and make oil-palm stem material uneconomical as a substitute for solid timber. However, research is progressing and trials utilizing oil-palm fibre in mechanical and chemical pulping processes show promise. Research on utilizing oil-palm in wood panels and in gypsum fibreboard has advanced faster (Kollert, Killmann and Sudin, 1994). The use of palm fronds in moulded furniture, the production of particle board and activated carbon and the sawing and lamination of palm trunks are also being investigated (Razak, 2000).

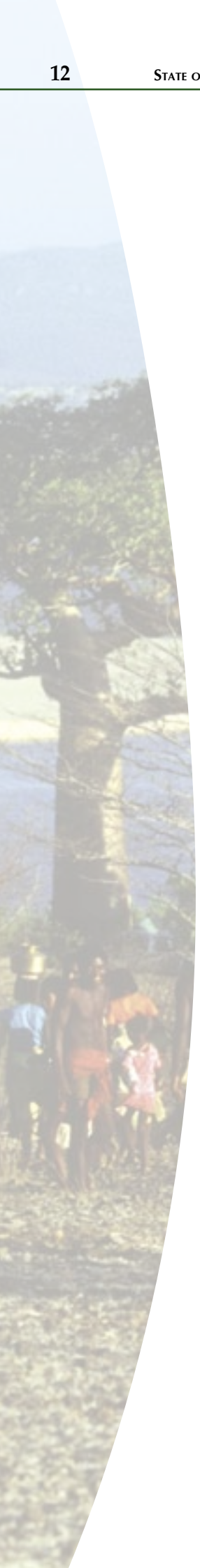
Bamboo

Material from the stems of monocotyledonous bamboo has a long history of use in Asia and from this perspective barely qualifies as a "new wood" (see also Box on page 12). However, many new uses are opening up opportunities for growers and processors. Bamboo culms (stems) have been traditional substitutes for timber in construction and scaffolding, and these uses remain vitally important in Asia today. Recent technological developments have cleared the way for using bamboo in reconstituted panel and board products (Ruiz-Pérez *et al.*, 2001). Bamboo furniture and flooring are gaining market share, with new and innovative designs contributing to this growth.

China and India have the world's largest bamboo resources (see Box on page 12). China is the world's largest producer of commercial

M. LOBOVIKOV

The many uses of bamboo – including corrugated roofing and paper making – are opening up opportunities for growers and processors in Asia



Products, goods and services from secondary forests

Found in tropical, subtropical and often temperate zones, bamboo is an ancient woody grass that numbers up to 90 genera and 1 500 species, of which only about 50 species are domesticated so far.

More than 1 billion people live in bamboo houses, and 2.5 billion people depend on this resource for their livelihoods. Besides traditional use for construction, furniture, handicrafts and food, bamboo is increasingly being recognized as an environmentally friendly and cost-effective wood substitute for producing pulp, paper, boards, panels, flooring, roofing, composites and charcoal. Bamboo shoots are rich in fibre and are competing vigorously in the international vegetable market. In addition, bamboo has significant potential to help cope with wood shortages, reduce deforestation and reverse environmental degradation. While only 10 to 20 percent of bamboo consumed reaches international markets, the value of annual trade is about US$5 to $7 billion. By comparison, trade per year in tropical timber and in bananas is estimated at about US$8 billion and $5 billion, respectively.

Although global statistics on bamboo resources are poor despite sophisticated assessment techniques developed over the past 20 years, figures are improving at the national level. India reports 9 million hectares of bamboo forest and clumps, China counts 7 million hectares of bamboo, including 4 million hectares of plantations, and Ethiopia has 2 million hectares. Latin America is presumed to have 11 million hectares of bamboo, excluding the Andes (Jiang, 2002). According to the lowest estimates, bamboo makes up about 1 percent, or 22 million hectares, of tropical and subtropical forest cover with an annual sustainable harvest of about 20 million tonnes. If current trends persist, bamboo area and stock proportion are expected to double or triple by 2025.

Headquartered in Beijing, China, the International Network for Bamboo and Rattan (INBAR), through participating organizations and individuals from all continents, develops and assists in the transfer of technologies and solutions to benefit people and their environment.

bamboo, with unprocessed bamboo valued at US$1.5 billion in 1999 (Ruiz-Pérez *et al.*, 2001). Processing is estimated to have added another US$1.3 billion to this total. The sector provides part- or full-time employment for more than 5 million people in China.

India's annual harvest totals approximately 4 million tonnes, with slightly more than half used in rural construction and scaffolding (Ganapathy, 2000). Most of the remainder is for making pulp and paper. Bamboo is also used extensively to make paper in Bangladesh, China, the Philippines, Thailand and Viet Nam.

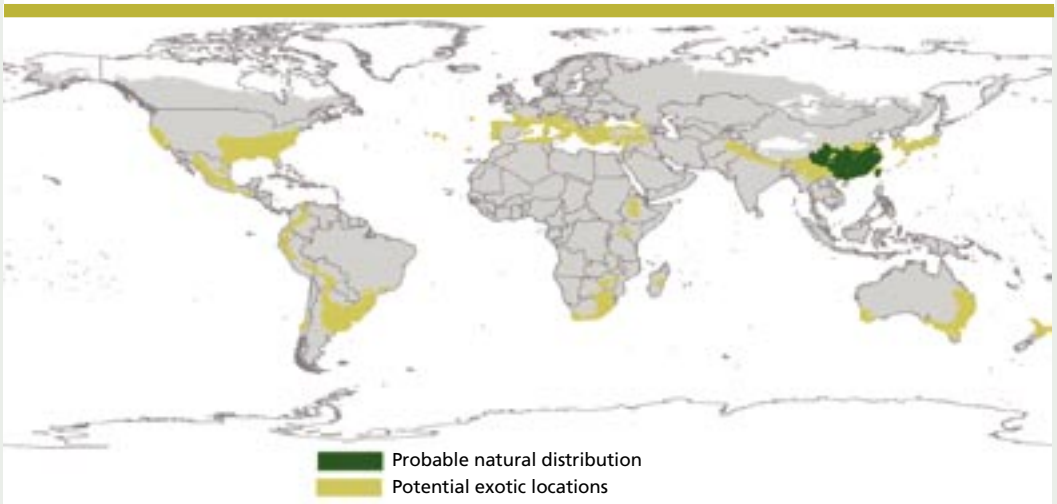
Household fruit- and timber trees

Most countries in Asia use at least some wood from fruit-trees as commercial timber, and a growing number of households have become important sources of this wood. In Sri Lanka, for instance, where the enforcement of a logging ban in natural forests has necessitated the use of alternative sources of timber, an estimated 500 000 cubic metres of logs (40 percent of the country's supply) come from home gardens (Bandaratillake, 2001; Ariyadasa, 2002). In the densely populated Indian State of Kerala, an estimated 83 percent of all timber (12 million cubic metres per year) comes from homesteads (FAO, 2001).

Several fruit-tree species such as jackfruit (*Artocarpus heterophyllus*) and tamarind (*Tamarindus indica*) supply high-value wood for furniture and cabinets in several countries of the region. More traditional timber species

In collaboration with the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), INBAR has developed an innovative approach to quantify and map the likely range and distribution of bamboo species (Bystriakova *et al.*, 2003; Bystriakova, Kapos and Lysenko, 2004). Figure 1 is an example.

FIGURE 1
Natural distribution and matching sites for the bamboo species *Phyllostachys pubescens*



Source: INBAR.

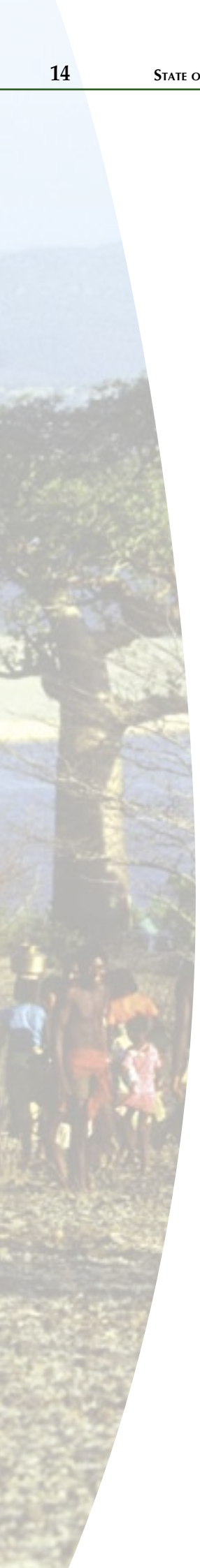
such as mahogany (*Swietenia macrophylla*) and teak (*Tectona grandis*) and other trees such as kapok (*Ceiba pentandra*), domba (*Calophyllum inophyllum*), mango (*Mangifera indica*), durian (*Durio zibethinus*) and sapu (*Michelia champaca*) are also grown in home gardens and commonly used.

On the island of Bali, Indonesia, where carving is an important feature of local culture and livelihoods, *Paraserianthes falcataria* grown alongside rice fields has become an important raw material. In Thailand, wood from the rain tree, also known as monkey pod (*Samanea saman*), has replaced scarce teak wood in the carving industry. Rain tree wood is also increasingly used to make furniture in the Philippines, Thailand and other Asian countries.

Other fibre sources

Agricultural residues have been used in paper making in Asia for centuries, but recent technological advances in collection and handling have spurred production of non-wood pulp to more than 16 million tonnes (FAO, 2004), of which 14 million are produced in China.

Straw, the main by-product of grain harvesting, is the non-wood fibre used most widely in pulp and paper manufacturing in Asia, with wheat and rice straws the most common. Of the more than 10 million tonnes of straw-pulping capacity in Asia, China alone accounts for 9.7 million tonnes. Other major producers of straw-based papers are India, Indonesia, Pakistan and Sri Lanka.



Bagasse, the fibrous residue left after extracting juice from sugar cane, is another important fibre source. In India, the world's largest sugar producer, an estimated 7.2 million tonnes of bagasse could be used in making pulp and paper (Ganapathy, 2000). Currently, India produces more than 1 million tonnes of paper from bagasse each year and has the world's largest bagasse mill. Other countries producing this type of pulp include Bangladesh, China, Indonesia, Pakistan and Thailand. In the manufacturing of particle board, 70 percent of Pakistan's production was made from bagasse as early as the 1980s (Killmann, 1984). Reeds, jute, abaca (manila hemp) and kenaf (*Hibiscus cannabinus*) are other non-wood fibres used in making pulp and paper.

Innovative uses of agricultural residues are emerging to manufacture reconstituted panels and boards in Asia. In Malaysia, for example, rice-husk boards for flooring, panelling and furniture have created considerable interest during the past five years because of their high silica content, which renders them durable and termite proof.

Generally equivalent to medium-density fibreboard in strength and appearance, strawboard is another panel product being commercialized. Mills are being established in several Asian countries. The product has cost and environmental advantages in that disposal of straw is expensive if it is ploughed under and polluting if it is burned.

Prospects

Extrapolating the expansion rates of the main "woody" agricultural plantation crops recorded in Asia reveals an estimated 27.4 million hectares of a largely untapped resource. Meanwhile, other woody species such as bamboo and various fruit-trees, along with agricultural residues, are significant in the production of pulp, paper, reconstituted boards and specialty products. Asia's history of innovation in the forestry sector suggests that these "new woods and fibres" will have an increasingly important influence on the forest products industry in decades to come.

INTERNATIONAL TRADE IN NON-WOOD FOREST PRODUCTS

As defined by FAO, NWFPs consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests. This section presents latest results of an ongoing FAO study on the value, trends and flows in international trade in NWFPs over the past decade. The assessment was mainly based on a review of the *Comtrade* database (UN, 2004), which aggregates data on traded commodities as reported by national customs agencies in accord with the International Convention on the Harmonized Commodity Description and Coding System, also referred to as the Harmonized System (HS) (WCO, 2004). Where needed and possible, the information was supplemented with data from national customs agencies of major trading countries.

Tables 5 and 6 present total import values of raw materials, as well as semi-processed and processed products, for 1992 and 2002. All figures are in current rather than real US dollars, so that the growth in trade of most goods appears more than it actually is.

Most of the 28 commodities listed in Table 5 are unprocessed, although a few semi-processed products are included. For 2002, their total import value amounted to US$2.7 billion. Excluding the two commodities that were not coded in 1992 (mushroom categories 070959 and 071239), the total value of the remaining 26 increased from US$1.9 to $2.1 billion between 1992 and 2002. Eleven rose in value, eight remained the same and seven declined.

Table 6 lists 34 commodities at different stages of processing, originating from both inside and outside forests, with a total import value for 2002 of US$7 billion. By comparison, the value of global imports of wood-based forest products for the same year, including fuelwood and charcoal, amounts to US$141.4 billion (FAO, 2004). Excluding the five commodities for which trade data cannot be compared because codes did not exist in the 1992 HS, the total value of trade of the remaining 29 increased from US$4 billion in 1992 to $6.2 billion in 2002. It increased for 21, remained the same for three and declined for five.

TABLE 5

Global import values of key NWFPs for which HS code refers to a single product, 1992 and 2002

HS code	Commodity description	Global import value ('000 US$)	
		1992	2002
060410	Mosses and lichens for bouquets, ornamental purposes	9 352	25 476
070952	Truffles, fresh or chilled	4 201	23 656
070959	Mushrooms other than *Agaricus*, fresh or chilled	n.a.	364 412
071239	Mushrooms (excl. 071331/33) and truffles, dried	n.a.	219 458
200320	Truffles, prepared or preserved, not in vinegar	3 049	11 012
080120	Brazil nuts, fresh or dried	44 344	59 848
080240	Chestnuts, fresh or dried	109 958	184 663
230810	Acorns and horse chestnuts for animal feed	1 216	7 380*
120792	Sheanuts (karite nuts)	5 155	5 136*
121110	Liquorice roots	33 455	24 310
121120	Ginseng roots	389 345	221 435
121190	Plants and parts, pharmacy, perfume, insecticide use n.e.s.	689 926	777 980
121210	Locust beans, locust seeds	22 395	40 239
130110	Lac	25 286	25 653
130120	Gum arabic	101 312	105 510
130190	Natural gum, resin, gum resin, balsam, not gum arabic	92 755	96 535
400130	Balata, gutta-percha, guayule, chicle and similar gums	26 726	13 605
130214	Pyrethrum, roots containing rotenone, extracts	27 865	26 173*
140110	Bamboos used primarily for plaiting	37 562	50 054
140120	Rattan used primarily for plaiting	118 987	51 327
140210	Kapok	11 920	2 826*
170220	Maple sugar and maple syrup	43 632	116 202
200891	Palm hearts, otherwise prepared or preserved	16 082	67 514
320110	Quebracho tanning extract	51 938	45 173
320120	Wattle tanning extract	63 877	34 168
320130	Oak or chestnut extract	8 653	917*
450110	Natural cork, raw or simply prepared	7 874	110 702
530521	Abaca fibre, raw (*Musa textilis*)	15 221	20 374

* 2001 value (as no longer in HS 2002).
Notes: n.a.: not applicable as this code did not exist in the HS 1992 version.
n.e.s.: not elsewhere specified.
Source: UN, 2004.

Between 1992 and 2002, import values of the 55 commodities in the two tables increased by 50 percent, from US$5.5 billion to $8.3 billion. However, the total global import value of all commodities listed in the 1992 and 2002 HS, as recorded by trading countries, increased almost two and a half times, from US$2.24 trillion to $5.56 trillion. In addition, the share of global trade of the 55 commodities decreased from 0.25 percent to 0.15 percent, mostly as a result of a decline in the price of raw materials and because other materials gained in popularity.

Products that saw no real increase in their traded values are shea nuts, gum arabic, balata, gutta-percha, kapok, tanning extracts of quebracho and black wattle, Brazil nuts,

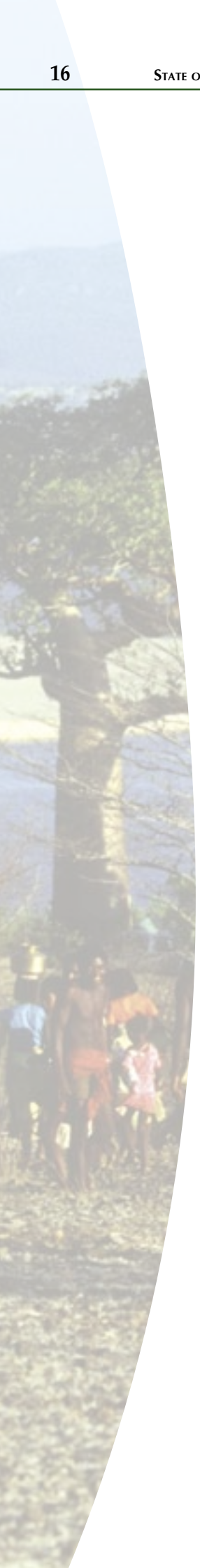


TABLE 6

Global import values of selected commodities for which HS code includes NWFPs among others, 1992 and 2002

HS code	Commodity description	Global import value ('000 US$)	
		1992	2002
010600	Animals, live, except farm animals	183 922	404 633
030110	Ornamental fish, live	137 886	240 965
040900	Honey, natural	268 184	657 612
041000	Edible products of animal origin n.e.s.	80 389	175 770
051000	Ambergris, civet, musk, etc. for pharmaceutical use	134 088	93 942
060491	Foliage, branches, for bouquets, etc. - fresh	n.a.	587 689
060499	Foliage, branches, for bouquets, etc. - except fresh	n.a.	103 998
071230	Mushrooms and truffles, dried, not further prepared	134 205	286 661*
200390	Mushrooms n.e.s., preserved, not pickled	n.a.	82 848
080290	Nuts edible, fresh or dried, n.e.s.	222 915	403 243
090610	Cinnamon and cinnamon-tree flowers, whole	95 626	81 332
090620	Cinnamon and cinnamon-tree flowers, crushed or ground	8 531	18 606
110620	Flour or meal of sago, starchy roots or tubers	18 063	10 060
120799	Oil seeds and oleaginous fruits, n.e.s.	62 297	161 428
130232	Mucilages and thickeners, from locust bean, guar seeds	141 335	254 683
130239	Mucilages and thickeners n.e.s.	138 579	374 674
140190	Vegetable materials n.e.s., used primarily for plaiting	39 670	38 181
140200	Vegetable materials for stuffing/padding	n.a.	3 751
140300	Vegetable materials for brush/broom making	n.a.	23 519
140410	Raw vegetable material primarily for dyeing and tanning	31 063	33 855
140490	Vegetable products n.e.s.	63 859	127 767
320190	Tanning extracts of vegetable origin	20 515	50 450
320300	Colouring matter of vegetable or animal origin	152 082	384 133
330129	Essential oils, n.e.s.	312 524	533 464
330130	Resinoids	61 359	37 282
380510	Gum, wood or sulphate turpentine oils	31 232	35 418
380610	Rosin and resin acids	166 133	224 360
410320	Reptile skins, raw	11 252	78 366
430180	Raw fur skins of other animals, whole	44 025	88 240
460110	Plaits and products of plaiting materials	17 198	38 927
460120	Mats, matting and screens, vegetable plaiting material	215 957	196 784
460191	Plaited vegetable material articles not mats or screen	44 732	120 719*
460210	Basketwork, wickerwork products of vegetable material	789 991	968 044
660200	Walking sticks, seat-sticks, whips, etc.	10 769	44 369

* 2001 value (as no longer in HS 2002).
Notes: n.a.: not applicable as this code did not exist in the HS 1992 version.
n.e.s.: not elsewhere specified.
Source: UN, 2004.

sago flour and wickerwork. These originate in developing countries and were traded as raw materials. Commodities that saw their import values sharply increase are mosses/lichens and foliage for flower bouquets, truffles, other mushrooms, maple syrup, cork, mucilages and thickeners from locust bean (carob), essential oils not elsewhere specified, live animals other than farm animals, natural honey and raw reptile skins. They represent semi-processed products and are mainly produced and traded by developed countries (Europe, North America) and China.

Interpretation of trends

Trends in trade of NWFPs over the past decade need to be interpreted with caution, especially when these items enter the market as ingredients of composite products – a fact that makes their identification difficult in country statistics, complicates the aggregation of their trade value and possibly underestimates their importance. From 1992 to 2002, the value of global trade in related commodities, in current dollars, increased 1.5 times. Trade statistics suggest a modest increase in the total value of NWFPs compared with the growth in overall trade.

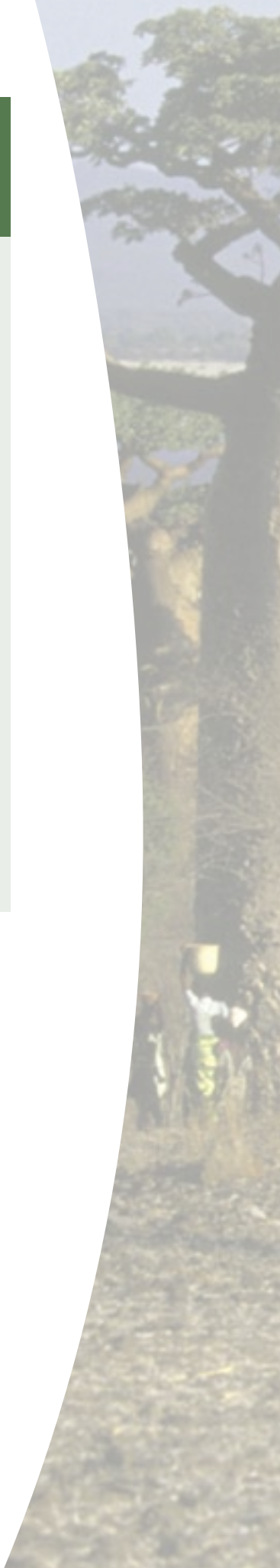
Developing countries exported NWFPs as raw materials in the past, but are now processing many of them prior to export. Today the value of trade in NWFPs is mainly from processed products being traded among developed countries (mostly in Europe and North America) and China.

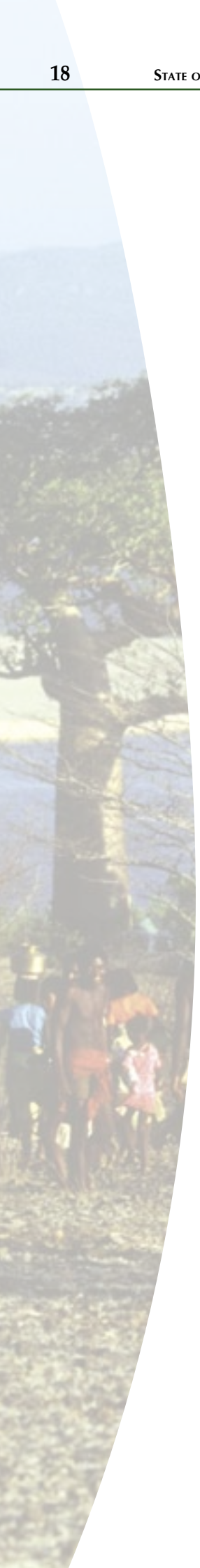
Many NWFPs whose international trade is increasing originate from more intensive production systems, be they in- or outside the forest. More and more, the resources from which these products are derived are being domesticated and cultivated on farms, including important medicinal plants that, until the late 1980s, were obtained exclusively from the wild. In addition to clearing forests for agriculture or to make way for plantations of oil- and cocoa palm and rubber, forests are sometimes cleared to grow bamboo for shoot production in China, cardamom in northern India and *Ilex paraguariensis* for yerba maté in Argentina, for example. The potential negative impacts on forest biological diversity of further promoting or increasing trade in NWFPs also need to be clarified.

Prior to promoting commercialization of NWFPs in poverty alleviation programmes, a number of issues need to be carefully considered, including benefit sharing. Experience has shown that increasing trade of these products will not necessarily help poor people, given that the required skills and investment capital are often not available to them (Belcher, 2003). Many NWFPs are competitive only because those who gather the product in forests are paid low wages and often have no other option for cash income. When rural livelihoods improve through farming and industry jobs, rural people no longer want to

Difficulties associated with collecting, compiling and analysing trade data on NWFPs

- The term is not included in international commodity descriptions or in product classification systems.
- Listings that describe or categorize NWFPs within commodities vary considerably, as does their aggregated value, since there is no agreement among countries, agencies or authors on terminology.
- International commodity nomenclature and product classification schemes are silent on whether products originate from farms or in the forest.
- Several NWFPs are traded as processed or semi-processed products or as ingredients in other commodities and cannot easily be identified.
- Changes in product nomenclature in international statistical systems – with codes deleted, merged, split or added – make comparisons difficult over time.
- Not all countries report accurately on their trade.





collect NWFPs, as happened with cork in Italy and southern France, pine resin in former East Germany and rattan in Malaysia.

Assessing trade in NWFPs is a complex task, mainly because few products appear in classification and nomenclature systems. As recommended by an expert consultation convened by FAO and INBAR, 13 codes for bamboo and rattan products will be added to the HS for 2007 (FAO, 2003d). Similar efforts are required to give prominence to the most valuable NWFPs within other commodities. Such products include nuts, essential oils, mushrooms, oilseeds, medicinal plants, mucilages, colouring matter of vegetable origin, fruits not elsewhere specified and foliage for flower bouquets.

Local uses of NWFPs and their trade within countries have more impact on poverty alleviation and sustainable forest management than international trade. However, the effects of global trade need to be further investigated, given that the most commercially successful products are processed in developed countries and originate from intensive production systems, often outside the forest. ◆

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