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LAND USE

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Cover photo:
Cash crops replacing forest, Thailand
FAO/FO-6641/M.Kashio

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Land use

FAO's *State of Food and Agriculture 2007* noted that "human ingenuity applied to the production of food and other commodities has allowed production to keep pace with population growth and income-driven demand, but at the cost of considerable degradation of other ecosystem services" – including those of forests. This issue of *Unasylva* addresses the theme of land use and the relation of forests with other land uses. How do we balance forest conservation goals and the need for forest products and services with the need for land for agricultural crops, livestock, urban development and more recently biofuel crops?

Deforestation, forest degradation and other forest changes account for around 17 percent of global greenhouse gas emissions, more than the world's entire transport sector – a fact that has recently strengthened the argument for supporting forest conservation over other land uses and aggressively seeking measures to reduce deforestation. Future climate-change negotiations are likely to consider measures for reducing greenhouse gas emissions from deforestation and forest degradation (REDD). In the first article, R.M. Martin goes against the current, cautioning that advocacy of REDD may undervalue the economic and political forces behind deforestation. He argues that it may be more feasible to promote carbon uptake by restoring forest and agricultural landscapes and overcoming forest degradation than by using policy and economic tools to overcome deforestation.

The next two articles were developed from case studies presented at the international symposium "Our Common Ground: Innovations in Land Use Decision-Making", held 7 to 9 May 2007 at the University of British Columbia, Vancouver, Canada. These case studies show how individual groups resolve land and resource use issues or work together to achieve a common goal.

C. Azevedo-Ramos gives a broad overview of past and future challenges for development in the Brazilian Amazon, addressing the drivers of deforestation in the region, the contribution of science and technology to the solution of critical issues and the advancement of rules and regulations that can help orient land use. The Amazon basin has the world's largest contiguous tropical forest and is home to 20 million people. In the past 30 years, almost 60 million hectares of tropical forest were cut down there, most to support large-scale agriculture. But regional planning, backed by law enforcement, agro-ecological zoning and the expansion of protected areas, has slowed deforestation and improved biodiversity conservation in the Amazon. Developments are monitored through remote sensing and the results are posted on the Internet for public viewing.

The tropical forest of the Congo Basin in Central Africa has one of the world's richest concentrations of biodiversity. It provides food, materials and shelter for more than 75 million people and is a major source of wealth for the region. The Central African Forests Commission (COMIFAC) and other partnerships have fostered cooperation among countries of the region in harmonizing forest policies, building regional institutions and leveraging funds to finance large-scale conservation programmes. L. Usongo and J. Nagahuedi describe a regional conservation strategy undertaken by the COMIFAC countries based on land-use planning in 12 priority landscapes (large ecosystems with consistent biological and socio-economic features). The approach involves establishing core protected areas surrounded by multiple-use zones.

The foreseen expansion of biofuel crops, triggered by climate change concerns and the heightened search for alternatives to fossil fuel, could have potentially severe consequences for forests and the people who depend on them, especially in tropical countries. An article by O. Dubois and two short pieces that follow it consider impacts of biofuel development on rural livelihoods, on people's access to land and on land use in general. Dubois's article offers policy recommendations for ensuring that biofuel schemes do not harm – and preferably help – small farmers and rural communities. A brief review examines the potential for deforestation and land-access problems as new land is brought into production for biofuel crops. A box (p. 32) points out the risk that if forests are cleared for biofuel crops, it is possible that the resulting greenhouse gas emissions could cancel out the emissions prevented by using biofuel in place of fossil fuel.

The issue concludes with some articles on other themes. P. Bhattacharya *et al.* discuss certification of wild medicinal and aromatic plants. The authors describe an attempt to adapt global norms and standards for national-level implementation through a project in four Indian states. Finally, R. Panwar and E. Hansen explore the concept of corporate social responsibility (CSR) in forestry, suggesting an issues management methodology for companies in the wood products sector. An example of CSR from Chile follows.

With the risks posed by climate change, maintenance of forest ecosystem services and sustainable production of forest products are more vital than ever. But the earth's population is growing and its cultivable land is finite. Conflicts are likely. Decision-makers will have to weigh the trade-offs between different land uses. A coordinated, multisectoral approach to policy-making and planning in forestry, agriculture, trade, development, energy, climate and transportation is thus essential to achieve the land-use mix that best meets the needs of each country.

Deforestation, land-use change and REDD

R.M. Martin

Promoting forest restoration and sustainable forest management has more promise for mitigating climate change than narrowly focusing on reducing greenhouse gas emissions from deforestation and forest degradation (REDD).

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The Intergovernmental Panel on Climate Change's fourth assessment report (IPCC, 2007) estimated that the forest sector contributes 17.4 percent of all greenhouse gases from anthropogenic sources; most of this is due to deforestation and forest degradation. The Stern Review on the economics of climate change (Stern, 2007), furthermore, observed that "curbing deforestation is a highly cost-effective way of reducing greenhouse gas emissions".

Based on such scientific evidence, the thirteenth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP-13), held in Bali, Indonesia in December 2007, addressed the role of forests in climate change (UNFCCC, 2007). The Bali Action Plan, which outlines long-term cooperative action up to 2012 and beyond, calls for enhanced national and international action including: "Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries".

The Parties adopted a decision specific to the challenge, "Reducing emissions from deforestation in developing countries: approaches to stimulate action", which encourages Parties to address the drivers of deforestation relevant to their national circumstances. Thus, negotiations of a future protocol to limit emissions and stabilize atmospheric concentration of carbon dioxide (CO_2) are likely to consider measures for reducing greenhouse gas emissions from deforestation and forest degradation (REDD).

While deforestation is a particularly visible contributor to greenhouse gas emissions, this article argues that overcoming deforestation using policy and economic tools is much less feasible than promoting carbon uptake by overcoming forest degradation and restoring forest and agricultural landscapes. It suggests that the literature and political discussion advocating REDD as cost-effective and easy to achieve may significantly undervalue the economic and political forces behind deforestation.

HOW MANY TREES QUALIFY AS DEFORESTATION?

To begin with, the term "deforestation" is used loosely in the climate change negotiations. If the concept is to be debated by parties to UNFCCC, it needs to be firmly defined. The Global Forest Resources Assessment (FRA), an existing, well-vetted process that involves all national governments in defining and measuring the change in forest extent, would offer a suitable foundation (Holmgren *et al.*, 2007).

In considering the concept of deforestation, it should be noted that the removal of tree cover can be a normal part of forest management. The number of trees harvested and the portion of the area's biomass removed are a function of forest type, species composition, management plan, market conditions and a host of other factors. Just as harvesting agricultural crops is not usually an environmental threat, removal of timber from a forested site does not necessar-

FAO/FO-5616/H. HIRAOKE

Deforestation is land use conversion, not harvesting of timber. If a harvested forest is allowed to regenerate, the ecosystem effect of harvesting is carbon neutral; but if the forest is converted to another land use, carbon is released into the atmosphere (forest cleared for rice production, Indonesia)

ily create an enduring problem in the atmosphere. The carbon removed from the land as timber is typically only a share of the carbon on the land, with a substantial share remaining in soil and non-harvested trees. The carbon that remains after harvesting (and also the carbon in the harvested wood) is sequestered until the wood decays or is burned. If the land is encouraged or allowed to regenerate a new forest, the ecosystem effect of harvesting is carbon neutral. The atmospheric effect is minimized as the new trees take up carbon and sequester it.

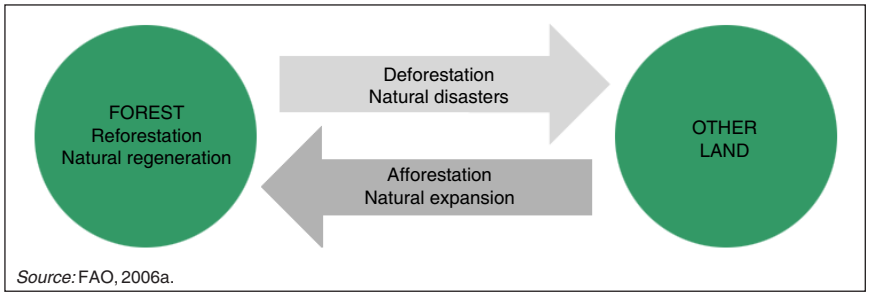
The atmospheric effect becomes problematic if the cycle is broken and the land is converted to another use – a car park, a field of soybeans, a pasture or the like. When land is converted to another use the remaining biomass is often burned, which releases considerable amounts of greenhouse gases into the atmosphere. The term deforestation denotes the change of intended land use from forest to non-forest (urban, agricultural, etc.), as distinct from the cutting of selected tree stems. A definition of "reducing emissions from deforestation" can thus be proposed as follows: "Avoiding the emissions associated with the burning or natural degradation of stored forest biomass on the site as it is converted to another land use that maintains or stores a lower quantity of carbon in biomass".

Knowing what to measure and account for at the level of a forested hectare is an important starting point. However, what will really matter in the context of emission reductions will be the overall carbon flows coming from forests and the means to account for these at the national level. Globally, deforestation occurs in most countries (for example, removal of forest cover for urban uses), but considerable area also returns to forests, whether naturally, from seeding or through planting. Generally, this is land that had been in agriculture or pasture that is no longer cultivated. Thus the global net change in forest cover is the sum of all positive and negative changes in forest area (increases and decreases) (Figure 1).

HOW ABOUT FOREST DEGRADATION?

Defining forest degradation can be equally challenging. While the visual image of a degraded forest may be one of spindly trees thinned to a paltry stocking with nothing of commercial value remaining, a fixed definition of this term remains elusive. The Second Expert Meeting on Harmonizing Forest-Related Definitions for Use by Various Stakeholders, held in Rome in 2002, proposed that forest degradation be defined as "the reduction of the capacity of a forest to produce goods and services" (FAO, 2002). While forest degradation has ecological interpretations, the climate discussion appears to be concerned only with the quantity of carbon sequestered by a forest area; in this context degraded forests would be those carrying less carbon than the land is capable of retaining (FAO, 2001). Is degraded forest a transitional land use where the carbon storage values have been constrained? What is the time period to be considered (long-term or permanent reduction versus short-term reduction)? Sound definitions and measurable parameters will be essential to know with any degree of precision if

1
Forest change dynamics



Source: FAO, 2006a.

future initiatives to reduce deforestation and forest degradation are successful. The opportunities for carbon sequestration in forest management may well lie in using explicit strategies to boost carbon sequestration in forests – the reverse of forest degradation being forest enhancement geared towards increasing the multiple ecosystem products and services of water, biodiversity, timber and/or carbon.

Assuming that deforestation and forest degradation can be defined and measured, the search for opportunities to reduce greenhouse gas emissions from these two sources raises interesting questions. When deforestation is defined as a land use change, it is necessary to ask who intended this change. Was it an explicit public or private choice? Did it just happen largely unnoticed over time? What were the motivations? In this sense, deforestation and forest degradation are a consequence of a number of explicit actions responding to the economic, political and social situation. Distributions of wealth, information and political power within the country also play a critical part.

NOW YOU SEE THEM, NOW YOU DON'T

Deforestation has been attributed to a spectrum of causes (ECOSOC, 1996; World Rainforest Movement, 2002; Estrada Porrúra, Corbera and Brown, 2007) ranging from lack of market reward for conserving forests (market failure) (Panayotou, 1992) to inadequate specification of property rights (Pearce and Brown, 1994), policy failure, poverty (Otsuka and Place, 2001) or poor management practices. All of these perspectives probably hold some truth.

Various actors participate in forest conversion: subsistence farmers, small farm operators, large farm enterprises, government and industry (see Box). They all respond to different economic and social incentives; thus different policy instruments or incentive systems may be

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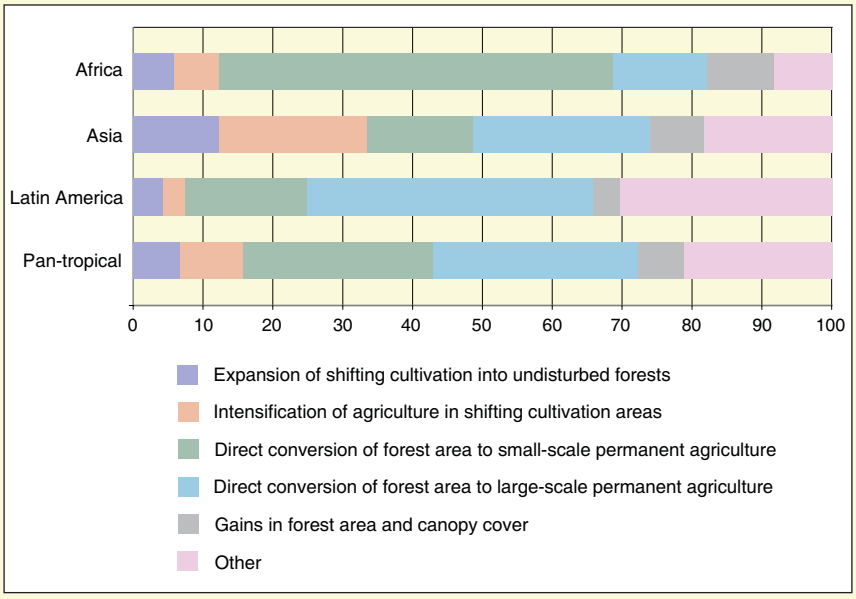
While a degraded forest is often assumed to look like this, with spindly trees and paltry stocking, no fixed definition exists; recent proposals emphasize the reduced capacity of the forest to produce goods and services

Where did all the forests go?

The Global Forest Resources Assessment 2000 (FAO, 2001) made a notable effort to document the transition of forest to other land uses and other land uses to forest, based on a pan-tropical look at land-use change using remote sensing images compared over time. The data, also available for 1980–1990 and 1990–2000, show that different forces are at work through time and in different continents. Thus remedies appropriate for Africa may be significantly different from those that might be effective in Asia or Latin America.

Percentage of total area change due to different causes, 1980–2000



Source: Based on FAO, 2001.

How agricultural policy determines the future of forests: some scenarios

A developed-country farmer with reasonably fertile land not far from a market could choose to grow maize or trees on her bare land. Since there are subsidies for agriculture, she fertilizes the soil, plants quality maize seed, protects the crop using herbicides and pesticides, harvests a bountiful crop of corn and buys a new car at the end of the year.

A subsistence farmer in a developing country has land a long way from the market. There are no agricultural subsidies, so she asks her mother to farm the land and watch over the children, and she goes to the city to find a job. Once the soil is almost drained of nutrients, she returns to take the mother and the children back to the city and trees start to grow on the land. Although the farmer abandons active farming and the land rests idle, seldom will she abandon title to her land. The land continues to serve many social and economic purposes: it represents a source of collateral for seeking finance; it represents a social anchor, the point of historical origin and a refuge in time of conflict; and it is an asset that will store value in the face of inflation.

Another developing-country farmer must decide whether to move to new land because this year's crop of maize and sorghum produced even less than last year. The only new land is covered with trees requiring considerable effort to clear. Still worse, he will have to move the family to a new unsettled area filled with uncertain dangers, where there are no schools for his children. He decides to plant the next crop and leave it in the charge of his wife, mother-in-law and sons, and he goes to start clearing new land.

needed to reduce the rate of deforestation and forest degradation, and strategies must target a multiplicity of actors.

In considering different approaches, it is first instructive to reflect on why forests exist at all – why is the earth not covered with productive farms, especially in light of current concerns over the rising prices of basic foods?

Generally, forests are found today where people could not farm sustainably in the past because of difficult market access, poor soils, slope or lack of water and the want of even meagre economic returns. Over the past two to three centuries, vast swathes of forest were cleared for cereals and cotton production in Europe and North America, and for cattle pasture and plantation production of sugar cane, tea, coffee, rubber trees and oil palm in Latin America and the Caribbean, Africa and Asia. Starting in the 1930s, after more than a hundred years of volatile fluctuation in agricultural product prices with harmful social consequences, a number of countries introduced various types of agricultural price supports to reduce the market vulnerability of farmers producing crops considered strategic for national security. Agricultural price supports in rich countries led to a cycle of investment and intensification which allowed the sector to meet demand readily with fewer and fewer farmers. As the cost of subsidies became a political issue, these countries sought to offset price supports by taking land out of agricultural production, including through tree planting. Thus the demographic transition of farmers abandoning their land for other careers facilitated a return of agricultural land to forest.

In poor countries, by contrast, farmers simply get poorer and more destitute. Some migrate to the city, while those who cannot migrate are doomed to pursue a cycle of disinvestment where they seek to survive on increasingly poor soils without nutrient inputs.

The examples in the Box above underscore the overwhelming significance of agricultural policy in determining the future of forests. They also highlight the difficulties faced by farmers without alternative income opportunities and social support systems.

In environments where soil fertility is chronically low, the poorest and weakest segments of society, those unable to stake claim to better lands, often resort to slash-and-burn agriculture as a survival strategy. Because the soils remain poor even despite their enrichment with biomass from the burned trees, only one to three years of production can be obtained from the site before the nutrients are exhausted and the farmers are forced to move on. In some areas, this method has evolved into a repetitive cycle with a fallow period allowing forest areas to regenerate.

Where the population following this cycle has increased, the negative consequences for the forest have also increased. Shorter fallow periods keep the soils drained and allow invasive grasses to take root. Farmers are forced to push ever deeper into the forest or more often further up the hillside to precariously steep lands. The profitability of this type of agricultural production is notoriously low. Production levels per hectare are low and the quality reduced. Ever-lengthening distance to markets obliterates net gains.

Based on this low profitability, some analysts have suggested that a carbon payment equal to the net returns on production, if offered to farmers for abstaining from this type of production, would be an efficient way to avoid the deforestation and burning. While it is easy to appreciate that the atmosphere would benefit if the farmers were not burning land cover, to make such REDD schemes operational it will be vital to ask why farmers undertake this strenuous, risky and dangerous work. Generally, these farmers are without alternative employment opportunities, and slash-and-burn agriculture is the last and most desperate effort for survival. In economic terms, the opportunity cost of their labour is zero or very near zero

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Slash-and-burn agriculture is carried out as a survival strategy by the poorest and weakest segments of society, those without alternative employment opportunities and unable to stake claim to better lands; a carbon payments may not be sufficient to dissuade such farmers from this type of production (shown, Bolivia)

because of a lack of non-farm rural or urban employment opportunities. The farming plot is also the farmer's residence and provides space for poultry, small animals and a vegetable garden. Thus, not having access to the farming plot as a living site has an opportunity cost.

While programmes to reduce deforestation must consider the situation of the small or landless farmer, other situations must also be considered. As the Figure in the Box on p. 5 demonstrates, forest conversion in Latin America and increasingly in Asia is often caused by commercial agriculture which is able to muster the significant capital required to clear, plant, manage, harvest and internationally market export crops at large scale. Price, export and income subsidies and trade policy are powerful agents influencing land-use change. The fixed costs of converting land from forest cover to agricultural or urban use are significant and require considerable investment capital. Deforestation depends largely on policies geared towards development and expansion of agriculture, transportation, energy and mining. In these regions, the agents of change today are largely well financed and well connected enterprises able to benefit from economies of scale in production, transportation and marketing.

Simple economic theory implies that land will be used for the purpose (forest, agricultural crops, residential or other land use) that yields the highest financial returns (greatest present net value). However, reality shows that agricultural markets are so heavily shaped by subsidies, trade policy and assistance schemes that a simple economic analysis to the individual farmer based on comparing returns to growing individual crops may cause more misunderstanding than enlightenment. Small changes in the price of corn or timber rarely cause an abrupt land-use change for small farmers like those described in the Box on p. 6. Changes in the relative prices of wheat and corn may cause a shift from year to year in a farmer's decision on what crop

Deforestation in Latin America and Asia is increasingly caused by large-scale conversion to plantation crops (shown, tropical forest removed for plantation of rubber or oil palm, Malaysia)

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to plant, but carbon payments would have to involve a significant guarantee for the future to convince an individual to give up farming. This is a major life change requiring new knowledge, skills, equipment and culture. The incentive needed to induce a farmer to make such a shift should be considered when REDD payment schemes are contemplated.

The underlying assumption with such incentive payments appears to be that an additional carbon payment will encourage existing owners to change their behaviour, favouring forest retention. In this sense, it is useful to look at the factors causing economic agents (individuals, families or business enterprise) to convert forest to another use. Conversion is time consuming, laborious and expensive.

FOREST IS LAND – AND LAND IS MONEY, POWER AND AUTHORITY

In many societies, agriculture and urban lands are privately held. Forests, however, are often deemed part of a collective patrimony serving the common good by providing, historically, meat, nuts, berries, medicinal plants, forage, fuelwood, building poles and so forth. Almost all countries, with only a few exceptions, constitutionally enshrine forested lands with a status of a public trust resource rather than a privately owned resource (FAO, 2006b). Decentralization and devolution of central government authority has sometimes transferred ownership and responsibility to a lower constitutional level (provincial, regional, municipality or commune), but a major share of the forest area across the globe – 84 percent – is publicly owned or managed (FAO, 2006a). On a regional basis, the percentage in Africa and Asia is even higher.

Over time, however, a great deal of forest area has been converted to other uses. A main motivating factor appears to be legislation allowing public land to go into private hands if the petitioner has "improved" the land – and in many countries an obvious measure of improvement is the removal of forest cover and its replacement with an agricultural crop or some other "economic" use. The conflict in logic here is that this conversion may not be legal *ex ante*. But since forests, especially in remote areas, suffer from weakness in law enforcement over vast areas, conversion, either abrupt or gradual, is difficult to control. *Ex post*, the land is improved and the economic agent petitions for regularization of title. This is not only a phenomenon of developing countries. It is likely that a number of the wildfires occurring in the Mediterranean region each summer are related to attempts to remove the vegetation as part of a land claim process.

Land conversion and land titling offer significant opportunities for building and storing wealth (de Soto, 2000). In societies troubled by a legacy of inflation, land assets are deeply treasured and sought. But this opportunity for wealth creation comes at significant risk, expense and investment. The readiness and ability of economic agents to undertake these risks is related to their wealth or poverty as well as their economic and political power.

Governments often actively or at least tacitly encourage settlement in remote or frontier areas. They effectively offer land grants in exchange for the risks and hardships that settlers will face. "Development" of remote areas allows governments to secure their perimeters, win votes and broaden their economic foundation. For example, the various governments holding Texas since the late seventeenth century – Spain, Mexico, the Republic of Texas and the United States – successively awarded land grants to settlers and to companies expected to sell the land to raise funds for transport infrastructure (Texas General Land Office, n.d.).

It is instructive to recall that settlement of forest and prairies was considered progress until recently, even in developed countries. Legal, institutional and economic systems still favour growth and development. Land grants, through titling, concession arrangements and other approaches, are among the few means available to governments to promote economic development. Thus REDD-related mechanisms must overcome powerful underlying incentives for forest conversion.

WILL MONEY MAKE A DIFFERENCE?

What are the economic arguments in favour of retaining forest cover? Moreover, will carbon payments make a difference? Is deforestation simply an economic issue, or must more be done in terms of policy, law and institutions to reduce greenhouse gas emissions from deforestation and forest degradation? The myriad factors underpinning deforestation include positive incentives for agriculture, transportation, mining, energy production and the like (Kanninen *et al.*, 2007). Where the same plot of land cannot support both uses at the same time, a positive incentive for agriculture may be a negative incentive for forests. The most efficient policy measures may well be the removal of agricultural subsidies that encourage deforestation.

As noted in the Box on p. 5, most deforestation results from conversion to subsistence farming or small-scale permanent agriculture or large-scale conversion to pasture, legumes, oil palm or plantation crops such as coffee, tea and cacao. The challenge to economic analysis of decisions leading to forest conversion lies in valuing the opportunity cost of capital and labour to the economic agents.

The economic theory underpinning financial transfers or other monetary rewards for REDD depends on three assumptions:

- market failure can be overcome through incentive payments;
- public investment in REDD is merited and can be supported politically;

- markets can achieve REDD objectives better than government controls.

The market failure argument holds that if there is no market for carbon, economic agents that convert forests to another land use lose no revenue for the carbon that would have been stored by keeping the land under forest cover. Economic theory assumes that they made the choice to convert from forestry to another land use because the new land use was more profitable. The assumption is that if a market for carbon could be created and economic agents could realize payments for carbon stored (receive an incentive), they might choose differently. Alternatively, if penalties (a disincentive) were imposed for releasing carbon, the assumption is that the economic agents would choose to avoid or minimize emissions.

The second argument is that, in the absence of transaction costs, if those who gain (the beneficiaries) from the provision of a public good could compensate those who lose and still realize overall gains, then the investment has merit. It is the economic equivalent of the greatest good for the greatest number over the long term. The public good sought in this case is an atmospheric concentration of CO_2 that does not exceed the level beyond which potential unknown consequences and processes might be set in motion, as established by the scientific community. Physically, this is said to be achievable through controls or limits on carbon emissions for the foreseeable future. The concept, therefore, is to use REDD-based incentives and other tools to mobilize investment for keeping atmospheric CO_2 below this threshold. Those who gain (everyone) must identify a way to motivate the losers, including those who would benefit financially from deforestation. The challenge is to build not only the argument for public support but also the means. A major effort under the Bali Road Map adopted at UNFCCC COP-13 is to find mechanisms for funding that would maintain public support among both the gainers and those that would forego a development opportunity. An important issue to maintain political support will be a clear definition of what is to be purchased and at what geographic scale – global or local.

Asian moist tropical forest under rehabilitation: positive incentives for forest restoration and stewardship could be a more efficient means of ensuring forest cover and could be easier to administer than avoiding deforestation

FAO/FO-6657/M. KASHIO

As a first stage towards a comprehensive global cap on carbon emissions, the Kyoto Protocol established national obligations for developed countries to reduce greenhouse gas emissions. Anticipation of and finally ratification of the Kyoto Protocol have facilitated the growth of a number of trading mechanisms whereby individual emitters that are able to keep their emissions below their allocation through energy conservation or new technology are allowed to sell their excess rights to emit. Likewise, emitters that cannot reduce their emissions or maintain them below the cap, or that find it cheaper to buy credits than to adopt emission-reducing technology, can buy credits.

Under a broader global "cap and trade" agreement, emission reductions might also include investments in forestry. The third economic argument underpinning REDD – that markets will contribute to achieving emission goals more efficiently (at a lower total cost) than government controls – rests on the assumptions that emitters would seek the least expensive means to achieve their obligations, thus reducing the total economic cost of meeting the overall global emission target; and that reducing deforestation could represent a low-cost alternative to more stringent controls in the transport, energy or industrial sectors. Most industrial plants and energy facilities adopt a given production technology that becomes relatively fixed over the life of the plant – perhaps 10 to 20 years. Faced with a cap on emissions, it is assumed that some would turn to the purchase of emission offsets offered through plans to reduce emissions from deforestation and forest degradation. Still to be considered, however, are the mechanisms to transmit the revenues from these purchases to the providers of the deforestation-reducing service.

RECONSIDERING THE BASIS FOR REDD

Governments generally seek to buy something with their tax dollars – security through defence expenditures, a more prosperous future through investments in science and education, better public health through vaccination programmes, etc. Public incentive systems seldom pay people *not* to do something – especially if

the "something" is widely considered to be contrary to the public interest. In most countries, unauthorized deforestation is against the law. Incentive payments to encourage people not to deforest will strike most voters as paying people not to do what is already against the law. Governments do not pay people not to commit arson, for example, even though the public and private costs of arson may far exceed what the perpetrator would consider good compensation. Such payments are avoided because they promote antisocial or imprudent behaviour by compensation seekers who would otherwise have been inhibited sufficiently by moral or legal censure. Farm subsidy programmes, employment insurance programmes and family safety net (welfare) programmes remain widely discussed and heavily criticized in most countries. Antipathy towards the idea of being paid to "not do something" seems deeply ingrained in the human psyche.

For this reason, reversing forest degradation may have the most promising future in the REDD complex, even if less carbon is saved and monitoring could be difficult. Forest degradation is the slow-death equivalent of deforestation. Continuous impoverishment of forest stock reduces carbon balances above and below ground. Effectively, the reverse of a negative externality (carbon emissions) is a positive externality (removing and sequestering excess carbon from the atmosphere). Rebuilding the carbon storage capacity in degraded or denuded forest lands represents a positive investment producing a public good: sufficient atmospheric capacity to absorb industrial and transport-sector emissions without tripping alarm bells while new low-carbon energy technologies come into play. Within this context, countries and economic agents receive compensation for sequestering carbon and sustaining it. The voluntary carbon markets are increasingly evolving along these lines. They deal in new forest plantations, improved management of degraded lands and restoration of forested watersheds. At the global level, countries could be recognized for increasing their carbon stocks in natural environments – agricultural soils, woodlands, urban greening and forests. Indeed, positive incentives for tree planting and stewardship could be a more efficient means of ensuring forest cover and could be easier to administer than avoiding deforestation. Trees planted outside the commons on private farms and community plots have better defined tenure, allowing their stewards more clearly to claim ownership. In principle, the Clean Development Mechanism (CDM) allows for projects in land use, land-use change and forestry. In practice, however, less than a handful of afforestation/reforestation projects have been approved. This suggests that the CDM needs to be revisited in order to capture the unrealized benefits from forestry cited in the Stern Review (Stern, 2007) and elsewhere.

SUMMARY

Realizing a system of international payments or other economic incentives for countries to reduce emissions from deforestation and forest degradation will require detailed understanding of the deforestation process and the influences of agricultural, trade, development, energy and transport sector policies. Deforestation is often driven by a desire to acquire land as a source of collateral, as a store of wealth and as a hedge against inflation. Changing the trajectory of deforestation will require policy programmes that reduce incentives for forest cover removal as a basis for land titling. More importantly, developing countries will need to be able to realize development goals through other means. Otherwise governments will continue to see land development as one of the few means within their reach to meet their goals for economic competitiveness and security.

To realize contributions from forests in the context of climate change, the forestry community may need to return to its roots and explain with greater effectiveness the potential of sustainable forest management to boost the long-term carbon carrying capacity of forest biomass and soils. For the reasons indicated above, the political, social and economic costs associated with reducing deforestation are likely to be perceived as higher than the low opportunity cost from agricultural conversion. Discouraging economic agents seeking to capture land from engaging in deforestation will be politically challenging for governments. For commercial interests that can mobilize significant capital and access international markets competitively to produce the commodities in growing demand, the low level of carbon payments that could be foreseen will not be adequate to defer developments that can achieve scale economies. Furthermore, those who convert forest land may not own it, and would not necessarily be the recipients of payments made to discourage its conversion to other uses.

A more feasible scenario would be one where actions to reward carbon sequestration more broadly in the rural environment are acknowledged, and where governments have more flexibility to use funds gained under an international compensation mechanism to apply a variety of initiatives such as land-use planning, zoning, conservation easements, forest management planning and training for underemployed rural and indigenous populations. In this scenario, economic agents – government, individuals and business – would be compensated for producing something additional (new carbon stored) rather than rewarded for "not doing something" (not deforesting or not degrading). Special attention must be given to providing support to traditional forest users and subsistence farmers to promote carbon-rich, community-friendly sustainable forest management. ◆

Bibliography

de Soto, H. 2000. *The mystery of capital: why capitalism triumphs in the West and fails everywhere else*. New York, USA, Basic Books.

Economic and Social Council (ECOSOC) of the United Nations. 1996. *Underlying causes of deforestation*. Report of the Secretary General to the 2nd session of the Ad Hoc Intergovernmental Panel on Forests, 11–22 March 1996. E/CN.17/IPF/1996/2. New York, USA.

Estrada Porrúra, M., Corbera, E. & Brown, K. 2007. *Reducing greenhouse gas emissions from deforestation in developing countries: revisiting the assumptions*. Tyndall Centre for Climate Change Research Working Paper 115. Norwich, UK.

FAO. 2001. *Global Forest Resources Assessment 2000 – Main report*. FAO Forestry Paper No. 140. Rome. Available at: ftp://ftp.fao.org/docrep/fao/003/Y1997E

FAO. 2002. *Proceedings, Second Expert Meeting on Harmonizing Forest-Related Definitions for Use by Various Stakeholders*, Rome, 11–13 September 2002. Rome. Available at: www.fao.org/docrep/005/Y4171E/Y4171E00.htm

FAO. 2006a. *Global Forest Resources Assessment 2005 – Progress towards sustainable forest management*. FAO Forestry Paper No. 147. Rome. Available at: www.fao.org/docrep/008/a0400e/a0400e00.htm

FAO. 2006b. *Understanding forest tenure study in South and Southeast Asia*. Forestry Policy and Institutions Working Paper No. 14. Rome. Available at: www.fao.org/docrep/009/j8167e/j8167e00.htm

Holmgren, P., Marklund, L.-G., Saket, M. & Wilkie, M.L. 2007. *Forest monitoring and assessment for climate change reporting: partnerships, capacity building and delivery*. Forest Resources Assessment Working Paper 142. FAO, Rome. Available at: www.fao.org/docrep/010/k1276e/k1276e00.htm

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate change 2007: synthesis report*. IPCC fourth assessment report. Geneva, Switzerland.

Kanninen, M., Murdiyarso, D., Seymour, F., Angelsen, A., Wunder, S. & German, L. 2007. *Do trees grow on money? The implications of deforestation research for policies to promote REDD*. Forest Perspectives No. 4. Bogor, Indonesia, Center for International Forestry Research (CIFOR).

Otsuka, K. & Place, F. 2001. *Land tenure and natural resource management: a comparative study of agrarian communities in Asia and Africa*. John Hopkins University Press.

Panayotou, T. 1992. *Protecting tropical forests*. HIID Development Discussion Papers 416. Cambridge, Massachusetts, USA, Harvard University.

Pearce, D. & Brown, K. 1994. Saving the world's tropical forests. *In* K. Brown & D. Pearce, eds. *The causes of tropical deforestation – the economic and statistical analysis of factors giving rise to the loss of the tropical forest*, pp. 2–26. London, UK, UCL Press.

Stern, N. 2007. *Stern Review: The economics of climate change*. London, UK, H.M. Treasury.

Texas General Land Office. n.d. *History of Texas public lands*. Austin, Texas, USA. Available at: http://www.glo.state.tx.us/archives/history/toc.html

United Nations Framework Convention on Climate Change (UNFCCC). 2007. *Report of the Conference of Parties on its thirteenth session*, Bali, Indonesia, 3–15 December 2007. Geneva, Switzerland, UN.

World Rainforest Movement. 2002. *The direct and underlying causes of forest loss*. WRM Briefings. Montevideo, Uruguay. ◆

Sustainable development and challenging deforestation in the Brazilian Amazon: the good, the bad and the ugly

C. Azevedo-Ramos

Agricultural expansion, opening of new roads and migration of people to unexploited areas are all major causes of Amazon deforestation; thus many sectors share the responsibility for reversing it.

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Adapted from a paper presented at the symposium "Our Common Ground: Innovations in Land Use Decision-Making", 8–9 May 2007, Vancouver, Canada.

The Amazon region comprises 61 percent of Brazil's land area (5.3 million square kilometres), with a population of 20 million people. The region has the largest continuous tropical forest in the world and hosts around 20 percent of the world's plant and animal species. The potential for an economy based on forest resources is enormous. Although Brazilian participation in world trade of forest products is still small (around 3 to 4 percent) relative to other sectors (e.g. 20 percent in the meat sector), the forest sector comprises 8.6 percent of Brazilian exports and provides 6.5 million jobs. In south and southeastern Brazil, the forest plantation sector in particular has competitive advantages for growth, considering the climate, infrastructure and technological expertise. The diversity of the native forests in the Amazon similarly offers commercial potential that has not yet been fully explored. However, the equation for a balanced development associating economic growth with social and environmental benefits is not yet solved.

This article gives a broad overview of past and future challenges for development in the Brazilian Amazon, as well as recent achievements. In recognition of some similarities between the Amazon basin and the popular image of the American Far West, it borrows from the title of Sergio Leone's 1966 epic Western film *The good, the bad and the ugly* to observe the phases of Amazon development. However, the order is reversed to finish on an optimistic note, since much has been achieved. Passing from the worst to the best situation, the article addresses the drivers of deforestation in the region, the contribution of science and technology to the solution of critical issues and the advancement of rules and regulations that can help orient land use in the Brazilian Amazon.

Expansion of large-scale agriculture, while offering economic opportunities for Brazil, is the newest driver of deforestation in the Amazon region

C. AZEVEDO-RAMOS

Planting of soybean for animal feed and biofuel also drives forest conversion indirectly by displacing cattle ranchers to forested areas where land is cheap (state of Mato Grosso)

C. AZEVEDO-RAMOS

M. RANCOLETA

Unsustainable harvesting practices increase forest degradation and related biodiversity loss (Acre, Brazil)

THE UGLY

In the past three decades, land use in the Brazilian Amazon has been characterized by the intense exploitation of natural resources which has resulted in a mosaic of human-altered habitats without effectively improving quality of life and income distribution for the local population. About 17 percent of the Amazon forest, or 60 million hectares – an area equivalent to France – has been converted to other land uses in the past 30 years (INPE, 2008). Most of this area has been transformed into low-productivity pastures. These changes were the result of former strong governmental incentives for forest conversion and population migration to the region, characterizing a development pattern at that time where forests were seen as barriers for economic growth.

The trees in the Amazon forests contain 60 to 80 billion tonnes of carbon, more than the global emissions generated by humans in a decade. Deforestation in the Brazilian Amazon alone releases about 200 million tonnes of carbon annually, accounting for 3 percent of global net carbon emissions and 70 percent of national emissions (Houghton, 2005).

Around 1.5 million hectares per year are harvested for timber (Asner *et al.*, 2005), often using unsustainable practices that increase forest degradation and related biodiversity loss. Almost one-third of the Amazon forest has been degraded by the use of unsustainable practices. In addition, the summed effect of deforestation, degradation, and poor harvesting and slash-and-burn agricultural practices puts millions of hectares of forests at high fire risk. In El Niño years, forests are even more susceptible to fire because long periods of drought make forests drier and result in accumulation of fuel (dead leaves) on the ground (Nepstad *et al.*, 2004).

Forest exploitation and conversion have not brought true development, employment opportunities, better income distribution for local populations or environmental benefits to the region. Currently, about 45 percent of the population of the Brazilian Amazon has income below the poverty line.

THE BAD

Deforestation in the Brazilian Amazon results from the complex interaction of many direct and indirect drivers such as mining, logging, subsidies for cattle ranching, investment in infrastructure, land tenure issues, low law enforcement and the high price of grains and meat.

In recent years, however, large-scale agriculture has experienced sizeable expansion and become the newest driver of deforestation in the region. Brazil is one of the world's top producers and exporters of sugar cane, soybean, oranges and other products (FAO, 2008). In the nine states of the Brazilian Amazon, the area under intensive mechanized agriculture grew by more than 3.6 million hectares from 2001 to 2004 (Morton *et al.*, 2006). Particularly during this period, the greatest increase in area planted to soybean was in Mato Grosso, the Brazilian state with the highest deforestation rate (40 percent of new deforestation). By displacing cattle ranchers, soybean production has pushed the Amazon deforestation frontier further north. Between 2001 and 2004, the area deforested for cropland and mean annual soybean price in the year of forest clearing were directly correlated (Morton *et al.*, 2006). Forces driving the expansion of mechanized agriculture include lower transportation costs as a result of improved local infrastructure (roads, railroads, ports and waterways); higher international soy-

Deforestation, degradation, and poor harvesting and slash-and-burn agricultural practices lead to high fire risk for millions of hectares of Amazon forests

IPAM

bean prices; increased soybean demand from European markets because of the mad-cow disease (bovine spongiform encephalopathy); and rapid economic growth in China (9 percent per year) (Nepstad, Stickler and Almeida, 2006), which consumes great quantities of poultry and pork fed with soybean.

Soybean can also be used for biofuel. The Brazilian Government has declared the obligatory addition of 2 percent biofuel into petroleum diesel starting in 2008. In 2013, the proportion will increase to 8 percent, increasing biofuel consumption to 2.5 million litres per year. This policy, together with the announced interest of other countries in alternative fuels, has encouraged local producers to increase their soybean plantation area. About 2 million hectares will be needed just to meet the new Brazilian demand. In addition, Brazil has built up technological expertise in ethanol production from sugar cane.

Although the increased demand for soybean and the growth of biofuels represent excellent opportunities for Brazil, the challenge is to increase production without encouraging new deforestation. The Ministry of Agriculture states that the total area of already deforested and arable land in Brazil is more than enough to increase soybean plantations without need for further deforestation. For instance, the national production of ethanol could be doubled by using only 3.3 percent of Brazil's 90 million hectares of arable land. However, care must be taken to prevent new deforestation caused by displacement of other economic activities such as cattle ranching, which has already occurred. When biofuels increase demands for crops, prices will rise, farms will expand and displaced ranchers will clear new lands, usually in forested areas where land prices are still low. New occupation of areas that used to be remote, and which are associated with weak governmental presence and land tenure problems, tends to be chaotic.

Agribusiness has been one of the strongest forces for the implementation of new infrastructure in the region, especially roads. The current governmental infrastructure plan for the Amazon includes road paving, new hydropower projects and construction of waterways and ports. It has the potential to change drastically the social, economic and environmental situation of the Amazon. Paved roads can generate economic and social benefits, but also deforestation and forest degradation if not accompanied by regional planning. Studies have shown that more than 70 percent of deforestation occurs within 50 km of paved roads, while at most 7 percent occurs along unpaved roads (IPAM, 2000). The promise of a new highway (Br163) in the central Amazon has already taken many new sawmills to the region and redirected migration.

Seeking sustainable development in this particular region, civil society promoted a popular movement for participatory regional planning. The federal government then created a working group with the participation of 21 federal institutions to elaborate the "Br163 Sustainable Plan" based on studies and public hearings. State and federal governments adopted the plan, making a commitment for further actions and public policies associated with Br163. This initiative demonstrated the influence that well organized local civil society can have.

Regional planning demands synergy among public policies. In this regard, decision-makers can benefit from predictive models, which can show, among other things, trends in the forces of deforestation depending on different political choices. For instance, based on the historical relationship between deforestation and roads in the Brazilian Amazon, Soares-Filho *et al.* (2006) built a model that predicts Amazon deforestation under eight different scenarios depending on the number of new roads or roads paved and various development parameters. The output is projected scenarios of Amazon development up to 2050.

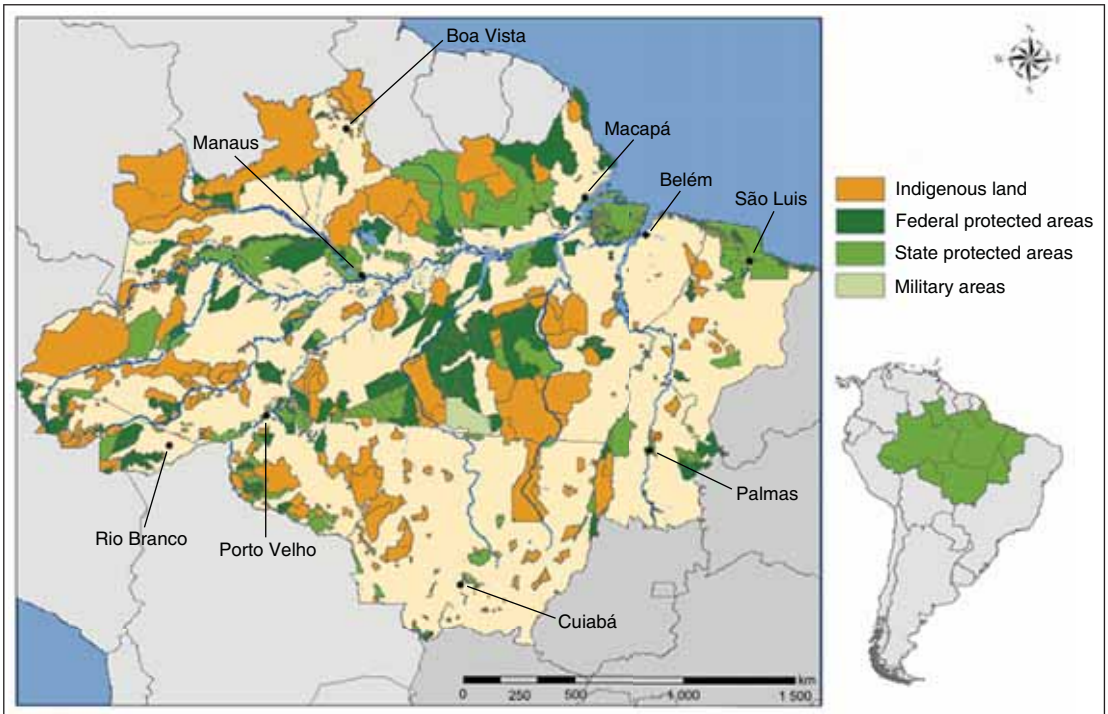
At one extreme is a "business-as-usual" scenario which includes all pavement of roads scheduled until 2027 (14 000 km of roads), low law enforcement, agricultural expansion and population growth and migration. According to the model, in this scenario 40 percent of Amazon forests would be lost between 2003 and 2050 (closed-canopy forest formation reduced from 5.3 million to 3.2 million square kilometres).

At the other extreme is a "governance" scenario which includes pavement of 11 500 km of roads up to 2026 along with law enforcement, agro-ecological zoning (preventing agricultural expansion onto inappropriate areas) and expansion and conservation of protected areas. The difference in deforestation between these two scenarios would be 1 million square kilometres.

The deforestation facilitated by road pavement and low law enforcement could also dramatically increase the annual net carbon emissions from the Amazon. The model predicts that under the business-as-usual scenario 32 billion tonnes of carbon would be emitted by 2050 (equivalent to four years of current global annual emissions), contrasted with 15 billion tonnes of carbon under the governance scenario.

Soares-Filho *et al.* (2006) also analysed the potential species loss in these two scenarios. By 2050, about 100 mammal species (30 percent) would lose more than 40 percent of the forests within their distribution ranges under the business-as-usual scenario, compared with 39 species (10 percent) under the governance scenario.

Protected areas assume an important role in forest and biodiversity conservation. For instance, almost 40 percent of mammal distribution ranges are within protected areas (Azevedo-Ramos *et al.*, 2006). Impacts of roads would be felt in 89 indigenous lands, 22 protected areas and 68 priority areas for biodiversity conservation – in 28 percent of protected areas overall (IPAM, 2000).



Protected areas in the Brazilian Amazon

Source: Ministry of Environment, Brazil

The analysis of Soares-Filho *et al.* (2006) showed that under a business-as-usual scenario, protected areas would do little alone, contributing to a reduction of new deforestation to 7 percent below the business-as-usual baseline. On the other hand, protected areas associated with a governance scenario could avoid one-third of the deforestation projected to occur by 2050 under the business-as-usual scenario.

THE GOOD

Most of the recommendations included in the governance scenario of Soares-Filho *et al.* (2006) have been put into action and enforced.

The federal government now acknowledges that reducing deforestation is not exclusively the concern of the Ministry of Environment, as it was historically believed to be. The government has established a committee involving 14 ministries to design and execute a plan for reducing Amazon deforestation. Monitoring and control of illegal deforestation have been particularly intensified. Brazil has advanced and transparent remote-sensing systems for monitoring deforestation, giving monthly and annual estimates (DETER and PRODES, respectively). The reports are posted on the Internet (www.inpe.br), and images are available for verification by members of civil society. A similar system for detecting illegal logging (DETEX) is being developed. Collaborative monitoring activities shared by the federal police and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) resulted in the arrest of more than 500 people involved in illegal deforestation or logging in 2005 and 2006. Moreover, 20 million hectares of new federal protected areas were established in those two years in the Brazilian Amazon (about 10 percent of the total). Currently, 48 percent of the Brazilian Amazon (about 201 million hectares) is in some kind of protected area (see Figure). These actions, together with a decrease in international soybean prices, have reduced Amazon deforestation by 52 percent since 2004 (INPE, 2008).

Brazil's energy matrix is considerably cleaner than that of other developing countries. About 20 percent of its energy production comes from renewable sources (wood, charcoal, sugarcane derivatives and others), and if hydroelectric energy is included this percentage goes up to around 60 percent. About 23 percent of the country's greenhouse gas emissions come from fossil fuel combustion and 75 percent from land use changes, primarily Amazon deforestation (Ministry of Science and Technology, Brazil, 2004). By reducing deforestation since 2004, Brazil has avoided the emission of approximately 200 million tonnes of carbon.

Strengthening the social, environmental and economic importance of forests, a new public forest management law was established in 2006. It stipulates that all public forests should remain public and retain their forest cover. They can be transformed into protected areas, allocated to traditional populations or sustainably used for economic purposes under forest concessions. The same law

created the Brazilian Forest Service, which has the responsibility to manage and protect the public forests. The law also established the National Fund for Forest Development, which supports forest-based activities such as research, capacity building and economic activities related to forest management. Another important change was the decentralization of forest management and monitoring, previously under federal government responsibility. Now, every Brazilian state has its share of responsibility for issuing forest management permits and for preventing illegal logging and deforestation.

As a means of strengthening the forest-based economy in the Amazon basin and as a part of major regional planning, the federal government is creating Sustainable Forest Districts – areas where public policies, concerning for example forest management, land tenure, energy, industry, education and science and technology, will be implemented to stimulate forestry or forest recovery. One district of 19 million hectares has already been created in the central Amazon (Br163). Two others are being planned in the Amazon.

FINAL REMARKS

The obstacles to sustainable rural development and conservation in remote areas are complex and difficult to overcome. New waves of people migrating to unexploited areas in search of better life opportunities and easy profit will make the prevention of illegal logging and deforestation a continuous struggle unless local institutions are reinforced and the State becomes more present in affected remote areas. Adequate policies based on land-use regulation, local governance and law enforcement could reduce deforestation and biodiversity loss and allow economic growth. Containing migration to the region still poses challenges, however. Brazilian agrarian reform, for example, has supported the creation of several new legal rural settlements in the Amazon. According to the new public forest management law, the settlers should develop forest-based activities in areas where there is forest cover. This means that rural public policy should now promote forest resource use (with training, credit and technology) instead of only agriculture. Otherwise, these settlers may become the new drivers of uncontrolled deforestation.

The production of biofuels offers important opportunities for Brazil – but policies must ensure that these opportunities do not come at the cost of new deforestation in the Amazon.

Support and incentives are needed to maintain the increasingly extensive protected areas. In this regard, the Brazilian Government proposed to the United Nations Framework Convention on Climate Change (UNFCCC) that developing countries should be compensated for reducing deforestation below their national historical rates, since the consequent reductions in carbon emissions generate benefits for all humanity.

Development has followed various phases in the Brazilian Amazon. Having reached a phase in which forest protection and sustainable use are promoted, the country needs to make this position permanent. Despite the achievements, challenges remain. Yet there is now stronger political and civic will to deal with them. ◆

Bibliography

Asner, G.P., Knapp, D.E., Broadbent, E.N., Oliveiri, P.J.C., Keller, M. & Silva, J.N. 2005. Selective logging in the Brazilian Amazon. *Science*, 310: 480–482.

Azevedo-Ramos, C., do Amaral, B.D., Nepstad, D.C., Soares-Filho, B. & Nasi, R. 2006. Integrating ecosystem management, protected areas and mammal conservation in the Brazilian Amazon. *Ecology and Society*, 11(2): 17–41.

FAO. 2008. FAOSTAT database. Available at: faostat.fao.org

Houghton, R.A. 2005. Tropical deforestation as a source of greenhouse gas emission. *In* P. Moutinho & S. Schwartzman, eds. *Tropical deforestation and climate change*, pp. 13–22. Belém, Brazil, Instituto de Pesquisa Ambiental da Amazônia.

Instituto Nacional de Pesquisas Espaciais (National Institute for Space Research, INPE). 2008. *Monitoramento da floresta amazônica brasileira por satélite – Projeto PRODES*. Available at: www.obt.inpe.br/prodes

Instituto de Pesquisa Ambiental da Amazônia (Amazon Institute for Environmental Research, IPAM). 2000. *Forward Brazil: environmental costs for Amazonia*. Belém, Brazil. Available at: www.ipam.org.br

Ministry of Science and Technology, Brazil. 2004. *Inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol: Brazil's initial national communication, Part II.* Brasilia, Brazil. Available at: www.mct.gov.br/upd_blob/0005/5163.pdf

Morton, D.C., DeFries, R.S., Shimabukuro, Y.E., Anderson, L.O., Arai, E., del Bon Espirito-Santo, F., Freitas, R. & Morisette, J. 2006. Cropland expansion changes deforestation dynamics in the southern Brazilian Amazon. *Proceedings of the National Academy of Sciences of the United States*, 103(39): 14637–14641.

Nepstad, D., Lefebvre, P., Lopes da Silva, U., Tomasella, J., Schlesinger, P., Solórzano, L.A., Moutinho, P., Ray, D. & Benito, J.G. 2004. Amazon drought and its implications for forest flammability and tree growth: a basin-wide analysis. *Global Change Biology*, 10: 704–717.

Nepstad, D.C., Stickler, C.M. & Almeida, O.T. 2006. Globalization of the Amazon soy and beef industries: opportunities for conservation. *Conservation Biology*, 20(6): 1595–1603.

Soares-Filho, B.S., Nepstad, D.C., Curran, L.M., Cerqueira, G.C., Garcia, R.A., Azevedo Ramos, C., Voll, E., Macdonald, A., Lefebvre, P. & Schlesinger, P. 2006. Modelling conservation in the Amazon basin. *Nature*, 440: 520–523. ◆

Participatory land-use planning for priority landscapes of the Congo Basin

L. Usongo and J. Nagahuedi

Central Africa's conservation approach is based on land-use planning in 12 priority landscapes, involving establishment of core protected areas surrounded by multiple-use zones.

Central Africa holds over 15 percent of the world's remaining tropical forest, the second largest contiguous forest on the planet. The forest provides food, raw materials, freshwater and shelter for over 75 million people and is a major source of wealth for the region. However, forest resources are threatened by overexploitation, clearing for agriculture and commercial bushmeat trade, all exacerbated by high population growth.

As described in this article, the Yaoundé process, the Central African Forests Commission (COMIFAC) and the Congo Basin Forest Partnership (CBFP) provide an enabling institutional environment fostering regional cooperation in forest conservation and rural development based on effective land-use planning. The core of the Convergence Plan endorsed by COMIFAC countries in 2002 – the road map for conservation initiatives in the Congo Basin – is land-use planning in 12 priority landscapes, which are large ecosystems with consistent biological and socio-economic features. These landscapes were selected using an ecoregional planning approach based on assessment of ecosystem representativeness, biodiversity significance, socio-economic importance and geopolitical and strategic factors. The participatory selection process involved national governments, conservation organizations and local stakeholders.

A REGION RICH IN NATURAL RESOURCES

The tropical forests of Central Africa cover more than 193 million hectares – an area almost four times the size of France (CBFP, 2006; ITTO, 2004). About 76 percent of the total forest area is production forest (Table 1) (CBFP, 2006). Lying at the equator, the region harbours among the richest concentrations of terrestrial biodiversity in the world. Although records are incomplete, the Congo Basin is known to be home to over 10 000 species of plants, perhaps 80 percent of which are endemic. The region supports the world's largest assemblage of tropical forest vertebrates: about 1 000 bird species (16 threatened, 36 percent endemic) and some 400 mammals which include 23 threatened species such as western and eastern gorillas, chimpan-

TABLE 1. Total forest area and proportion of production forests in the Congo Basin

Country	Total forest *(million ha)*	Production forest	
		(million ha)	*(% of total)*
Cameroon	19.6	12.0	61
Central African Republic	6.3	3.5	56
Congo	22.3	13.0	58
Democratic Republic of the Congo	108.3	98.0	83
Equatorial Guinea	1.5	1.5	79
Gabon	22.1	17.0	77
Total	**180.5**	**137.0**	**76**

Source: CBFP, 2006.

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Adapted from a paper presented at the symposium "Our Common Ground: Innovations in Land Use Decision-Making", 8–9 May 2007, Vancouver, Canada.

TABLE 2. Human welfare indicators for some Central African countries

Country	Area (km^2)	Population	Growth (%)	Fertility rate (births/ female)	Age structure (%)			Life expectancy (years)	Infant mortality (deaths/1 000 births)	Literacy >15 years of age (%)
					<14	15-64	>64			
Cameroon	475 440	17 340 702	2.47	4.39	41	56	3	51	64	79
Central African Republic	622 980	4 303 356	1.53	4.41	42	54	4	44	86	51
Congo	342 000	3 702 314	2.6	6.07	47	51	3	53	85	84
Democratic Republic of the Congo	2 345 410	62 660 551	3.07	6.43	47	50	3	52	86	66
Equatorial Guinea	28 051	540 109	2.05	4.55	42	56	4	50	89	86
Gabon	267 667	1 424 906	2.13	4.74	42	54	4	55	55	63

Source: CIA, 2007.

zees, bonobos (pygmy chimpanzees) and forest elephants (WWF, 2002). The Congo is the world's second richest river system for fish (700 species) and is distinguished by exceptional levels of endemism in both fish and molluscs. The Congo Basin forests also provide valuable global ecological services by absorbing and storing carbon dioxide, thereby helping to slow the rate of global climate change.

The Congo Basin contains four of Africa's freshwater ecoregions identified by the World Wide Fund for Nature (WWF, 2008) as globally outstanding for their high diversity of freshwater species. Between 75 and 95 percent of the rainfall in the Congo Basin is estimated to come from recycled water generated by evapotranspiration within the region. In this feature the region differs dramatically from other major tropical watersheds of the world; the Amazon Basin, for example, recycles only about 50 percent of its water (WWF, 2002). For this reason, central African forests are probably more sensitive and less resilient ecologically than other tropical moist forests.

SOCIO-ECONOMIC CONTEXT

Central African nations rank among the lowest in the world on most human welfare indicators and among the highest in population growth and fertility (Table 2). All countries in Central Africa except Gabon (which has relatively high urbanization and per capita income) have high population growth rates and a predominantly young population. Low literacy rates and lack of education, particularly among women, are recognized factors in the high fertility rates and are critical issues facing both conservation and human development in Central Africa. High population growth rates ultimately also affect the environment.

Ethnically, the main tribal groups living in the Congo Basin are Bantu groups and pygmies. Baka, BaAka and Bakola pygmies were formerly hunter-gatherers but are now becoming increasingly settled, both through their own choice and because of government policies. They have a largely interdependent social relationship with the Bantu made complex by ethnic rivalries.

Bantu farmers practice slash-and-burn subsistence agriculture; forest is felled and burned, providing nutrients for the crops. In addition to food crops, many farmers maintain small plots of cocoa grown under shade. Cocoa is grown for export and its production is thus linked to world market prices.

All the nations in the region are dependent on extractive industries (oil, mining, timber, wildlife and other non-wood forest products [NWFPs]) for a large percentage of their gross domestic product (GDP), almost all their foreign exchange and much of their tax revenues. Well capitalized and technically competent multinational corporations dominate

Baka pygmies, indigenous hunter-gatherers in the forests of southeastern Cameroon, are increasingly becoming settled

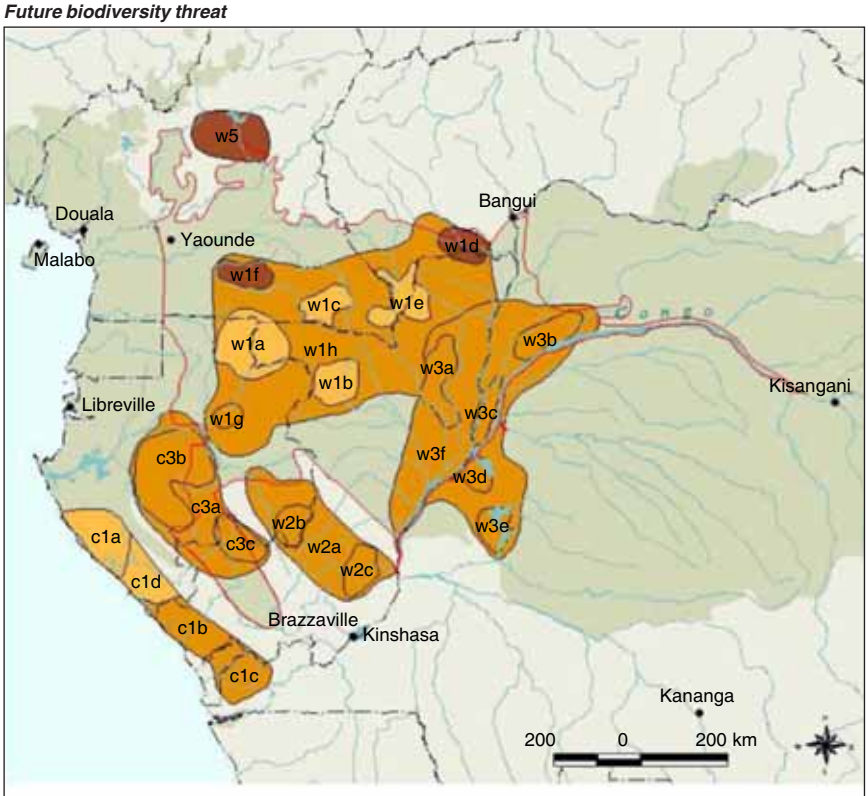
D. ROUGÉ

most extractive industries except artisanal gold and diamond mining.

The region's forests are a major source of local and national economic growth with revenues generated from logging, mining, hunting, fishing and trade in other NWFPs. The timber industry is an important source of national revenue and employment in all countries in Central Africa and will be a major determinant of the future state of forests in the region (Brunner and Ekoko, 2000). Timber exports contribute at least 40 percent of national GDP. Export of primary wood products from Cameroon, the Central African Republic, the Congo, the Democratic Republic of the Congo and Gabon generated US$995 million in 2003 (ITTO, 2004).

Wildlife also provides important revenue and employment, in particular for rural communities. In most of Central Africa, the rural revenue produced by both legal and illegal trade in bushmeat is probably equivalent or even superior to that produced by the logging industry. Wildlife killed as food in Central Africa amounts to 1 million tonnes each year (Eves *et al.*, 2002). Bushmeat cheaply provides a varied source of high-quality protein. It contributes between 30 and 80 percent of the protein consumed by forest-dwelling families in the Congo Basin. Furthermore, bushmeat hunting is a low-risk economic activity requiring almost no capital investment and producing very quick financial returns. Therefore sustainable village hunting has an important role in alleviating poverty among the most economically vulnerable people.

1
Future biodiversity threat



Source: WWF, 2002.

THREATS TO FORESTS AND BIODIVERSITY

The rich resource base of the Congo Basin provides immense opportunities for economic growth and sustainable development. However, much of the resource use and development has been uncoordinated, uncontrolled and unsustainable. Future threats to biodiversity are estimated to be high throughout the region (Figure 1). Allowing further environmental degradation to occur will diminish the very resources on which future economic development and the livelihoods of the people depend.

The threats to the Congo Basin have a number of diverse and interlinked root causes. These include local and global demands for forest products such as timber, meat and ivory – which are frequently met through unsustainable means of production – as well as global mineral and oil markets. Many NWFPs are also overexploited. Problems are compounded by inadequacies in both funding and capacity for sustainable resource management at all levels, and the lack of alternative livelihood opportunities for local people engaged in unsustainable production.

Climate change is also likely to have important impacts on forests and river basins. Although the science of predicting the regional impacts of global warming is still in its infancy, most models

D. ROUGE

Unsustainable logging is a threat to wildlife habitat and thus to the livelihoods of rural people who obtain revenue and employment from wildlife (lowland gorilla, Lobeke National Park, Cameroon)

predict approximately a 1 mm per day increase in rainfall across most of the Congo Basin by 2050, assuming a 1 percent per year increase in carbon dioxide (CO_2) (Parenti and Hanna, 2007).

Unsustainable logging

The World Resources Institute (WRI, 2000) estimates that 50 to 90 percent of central Africa's forests outside protected areas are under logging concessions; for example, 81 percent of Cameroon's forest is available for logging. Many loggers are not accountable to forestry administrations and other stakeholders seeking sustainable forest management.

Unsustainable logging is also a threat to wildlife habitat. However, with current unsustainable levels of hunting, many wildlife species will not survive long enough to be impacted by habitat loss (Sayer and Campbell, 2004).

Unsustainable hunting

Hunting for the commercial bushmeat trade is the primary threat to animal biodiversity in the Congo Basin. Pigs, primates, rodents and especially duikers (small forest antelope) are the most commonly hunted animals in the forest (Hochschild, 1998; Wilkie *et al.*, 2000). Regional and international demand (especially from China) for ivory is also driving the poaching of elephants. Unsustainable hunting threatens local extirpation of many vertebrates and regional species extinction for several large mammals, birds and reptiles.

Hunting is linked to logging, not only because of increased consumption of bushmeat within concession areas, but also because logging leads to improved road infrastructure and increased movement of people, in turn facilitating the supply of bushmeat to urban markets and enhancing the profitability of the trade through increased turnover rates.

The human population in the region is expected to double in 25 to 30 years (CIA, 2007). If the demand continues to grow as expected, and consumers do not or are unable to switch to eating meat from domestic livestock, then hunting of wild game will increase in the future. This will place most large mammals at risk of local or regional extinction.

Agriculture

Today, most people in the Congo Basin rely on shifting cultivation and small-scale permanent agriculture to provide their non-protein dietary needs. With population growing at the rate of 2 to 3 percent per year, clearing for agricultural purposes will constitute a major threat to forests in the long term.

If agricultural practices do not intensify and remain largely unchanged, most forests in the ecoregion might be converted to agricultural lands by the year 2025. Even in Gabon, where 60 percent of the population of 1 million lives in cities, over 20 000 km^2 of forest might be lost or degraded over the next 25 years, assuming that most food in Gabon is produced domestically (see Table 1 for the current situation). In Cameroon, increasing deforestation and forest degradation could affect more than 50 percent of forest.

LEGISLATIVE CONTEXT

The legal regimes in the different countries of the subregion are committed to long-term sustainable use of forest resources and to biodiversity protection; all require management plans for logging and other management interventions.

Land tenure systems remain a source of tension, with both State ownership and traditional land rights in the same area. There are essentially two parallel systems: the formal system, regulated by statute, in which land is owned and title is obtained; and a traditional system in which land use is regulated according to clan ownership. Legally, forests and natural resources such as minerals, timber and wildlife belong to the State, while rural communities, living on land that they regard as theirs by ancestry, are allowed usufruct rights.

In terms of land-use planning, forests are divided into permanent and non-permanent domains. In the permanent domain are the State forests (*forêts domaniales*), including national parks, wildlife reserves, hunting zones, game ranches, zoological gardens, wildlife sanctuaries, buffer zones, strict nature reserves, production forests and protection forests.

The non-permanent forests (or in Gabon rural forest, *domaine forestier rural*) are those that are not legally required to remain forest in the long term. In Cameroon the non-permanent forests include all community forests and forests belonging to private persons.

The forest legislation provides an adequate basis for habitat maintenance over large areas, as it allows for the creation of a large permanent forest domain made up of forest management units and

TABLE 3. Indicative list of funds mobilized by donors to support implementation of COMIFAC's Convergence Plan since the launch of the Congo Basin Forest Partnership

Donor	Funding *(million US$)*	Purpose
France	30	Protected areas, trust funds, sustainable forest management
Germany	>35	Protected areas, trust funds, sustainable forest management, community development
Italy	60	Debt cancellation
Netherlands	30	Community development, livelihoods, capacity building, natural resource management
European Union	45	Sustainable forest management
United States	128	Implementation of landscape programmes
World Bank	25	Natural resource management, especially targeting protected areas and promoting sustainable use
Global Environment Facility (GEF)	17	Land-use planning in TRIDOM landscape
United Nations Educational, Scientific and Cultural Organization (UNESCO)	8	World Heritage programmes
Conservation NGOs	120	Protected areas, trust funds, sustainable forest management, community development

Source: Rough estimates from project documents gathered 2002–2007.

protected areas. Governments recognize traditional use rights, encouraging the definition of regimes for collaborative management and benefit sharing with communities.

REGIONAL COORDINATION

The Yaoundé Declaration of 1999, signed by Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon, provides an institutional framework for collaboration on cross-border forest issues, creation of protected areas and development and implementation of sustainable forest management.

In May 2000, the signatory States established the Central African Forests Commission (Commission des forêts d'Afrique Centrale, COMIFAC) to direct, coordinate, harmonize and monitor forest and environment policies and initiatives in the subregion. In 2005, these six countries plus Angola, Burundi, Rwanda and Sao Tome and Principe signed a treaty which transformed COMIFAC into a legal entity empowered with full responsibility to coordinate all conservation initiatives in the Congo Basin. The treaty also provides a strong legal framework for negotiating with bilateral and multilateral funding agencies to establish long-term funding mechanisms for these initiatives.

The highest governing body for the Congo Basin collaboration is the Heads of State summit, programmed once every five years. The Council of Ministers under COMIFAC is convened every two years. COMIFAC has a regional secretariat in Yaoundé.

A regional umbrella structure, the Congo Basin Forest Partnership, brings together governments, non-governmental organizations, research institutions and universities, donor agencies, the private sector, indigenous forest peoples' groups and civil society to implement the Congo Basin conservation initiative. Endorsed at the World Summit for Sustainable Development in 2002, the partnership promotes economic development, poverty alleviation, improved governance and sustainable management of natural renewable resources. Its main focus is to support a network of well-managed national parks alongside sustainably managed surrounding forest areas that include logging or mining concessions, agricultural lands and community forests. The programme also provides assistance to surrounding local communities that largely depend on forest resources for their survival. CBFP is the highest-funded environment programme in the world, with contributions from bilateral and multilateral donors, international conservation organizations and research institutions (Table 3).

To ensure better coordination and implementation of the CBFP programme, COMIFAC has established and coordinates the following specialized regional structures, which also bring together other technical partners:

- the Conference on Central African Moist Forest Ecosystems (CEFDHAC), dealing with management of consultative processes within subregional and national fora;
- the Agency for the Development of Environmental Information (ADIE), for the management and dissemination of environmental information to all stakeholders;
- the Organization for the Conservation of African Wildlife (OCAW), which addresses biodiversity conservation and combats poaching across national borders;
- the African Timber Organization (ATO), which covers issues related to forest economics, forest certification and trade in forest products;
- the Network of Protected Areas in Central Africa (RAPAC), which provides linkages for management of national protected areas.

IMPLEMENTING CONSERVATION

COMIFAC supervises implementation of the Convergence Plan, which sets conservation priorities for the Congo Basin. The plan includes six strategic axes:

- harmonization of forest and taxation policies;
- knowledge of natural resources;
- management of ecosystems and reforestation;
- biodiversity conservation;
- sustainable valorization of forest resources;
- development of alternative economic activities and reduction of poverty.

The Convergence Plan focuses on 12 priority landscapes (Figure 2), many of which cross national borders. They were selected based on sound scientific research and knowledge of species endemism, biodiversity uniqueness, ecosystem resilience, threats and socio-cultural factors, including relations between indigenous forest communities and their environment. More than 150 scientists from different disciplines and organizations participated in Congo Basin–wide surveys and data analysis which led to the selection of these priority landscapes.

In these priority landscapes, community forest areas and other use zones are established through a participatory land-use planning process involving the government forest administration, local communities, private-sector partners such as logging companies and non-governmental organizations (NGOs). Four international conservation NGOs provide technical assistance to national governments in developing the land-use plans. WWF, for example, leads in seven of these areas, focusing its work on participatory land-use planning involving consultations with all stakeholders to map out multiple-use zones and important conservation areas within a network of protected areas. Sustainable natural resource use by local communities and stakeholders such as logging or mining companies is promoted in zones surrounding conservation areas, to ensure that local communities have access to natural resources and also benefit from forest revenues.

The transboundary landscape model was developed using a planning approach that focuses on the ecoregion as the unit of conservation, whereby policies and conservation practices are harmonized to ensure effective management of representative assemblages of genes and species within a particular ecosystem.

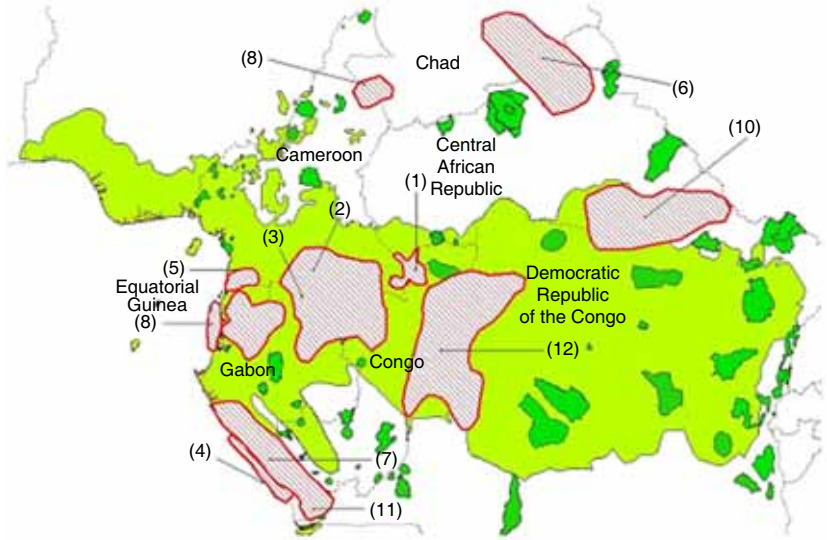
Coordination of transboundary programmes is regulated by agreements signed by member countries; they are endorsed by national parliaments of member countries and thus legally recognized. The Governments of Cameroon, the Central African Republic and the Congo, for example, signed an agreement establishing the Sangha Tri-national transboundary area (4.5 million hectares) and arranging for its collaborative management – an important step towards managing poaching and illegal logging in the subregion.

The land-use planning process of the Sangha Tri-national landscape has resulted in the establishment of core protected areas covering 780 500 ha with surrounding multiple-use zones making up about 3.7 million hectares (Figure 3). Broad management guidelines are being developed for the different forest domains. The multiple-use zones include community wildlife hunting areas and forest areas reserved for community forestry. Some of the communities, in southeastern Cameroon for instance, generate significant incomes from leasing community hunting areas for trophy hunting as well as through sale of wood from community forests. The Sangha land-use planning model will be replicated in other selected priority landscapes in the Congo basin.

Another vast priority landscape is the Dja-Odzala-Minkébé Tri-national transboundary area (TRIDOM), which involves 14.5 million hectares of forests in six protected areas in Gabon, Cameroon and the Congo. The agreement pertaining to this landscape, which contains ecologically rich protected areas at its core, was signed in 2005.

Transboundary agreements provide the institutional framework for enhanced cooperation in key conservation activi-

2
Priority landscapes in the Congo Basin



1. Sangha Tri-national
2. Dja-Odzala-Minkébé Tri-national
3. Minkébé-Mengamé
4. Mayumba-Conkouati
5. Campoma'an_Campo
6. Zakouma-Manovo-Gounda-St Floris
7. Mont Fouari
8. Estuaire du Rio-Muni
9. Boumbadjida-Binder-Lerelam
10. Bili Uere-Bangassou
11. Mayombe
12. Lac Tela-Lac Tomba

ties such as surveillance, research and monitoring, park management and participatory management involving local communities in villages across borders. Each transboundary programme has a technical committee bringing together protected area authorities of the countries involved. Transboundary committees work in collaboration with national governments and COMIFAC for programme coordination and implementation.

Since the first Yaoundé summit in 1999 more than 6.5 million hectares of new protected areas have been created. Of these, about 4.5 million hectares are forest protected areas (889 782 ha in Cameroon, 1 million hectares in the Congo, 515 000 ha in Equatorial Guinea and more than 2 million hectares in Gabon). Cameroon and Gabon have carried out scientific reviews of their national protected area networks and have approved new networks as a result.

CONCLUDING REMARKS AND LESSONS LEARNED

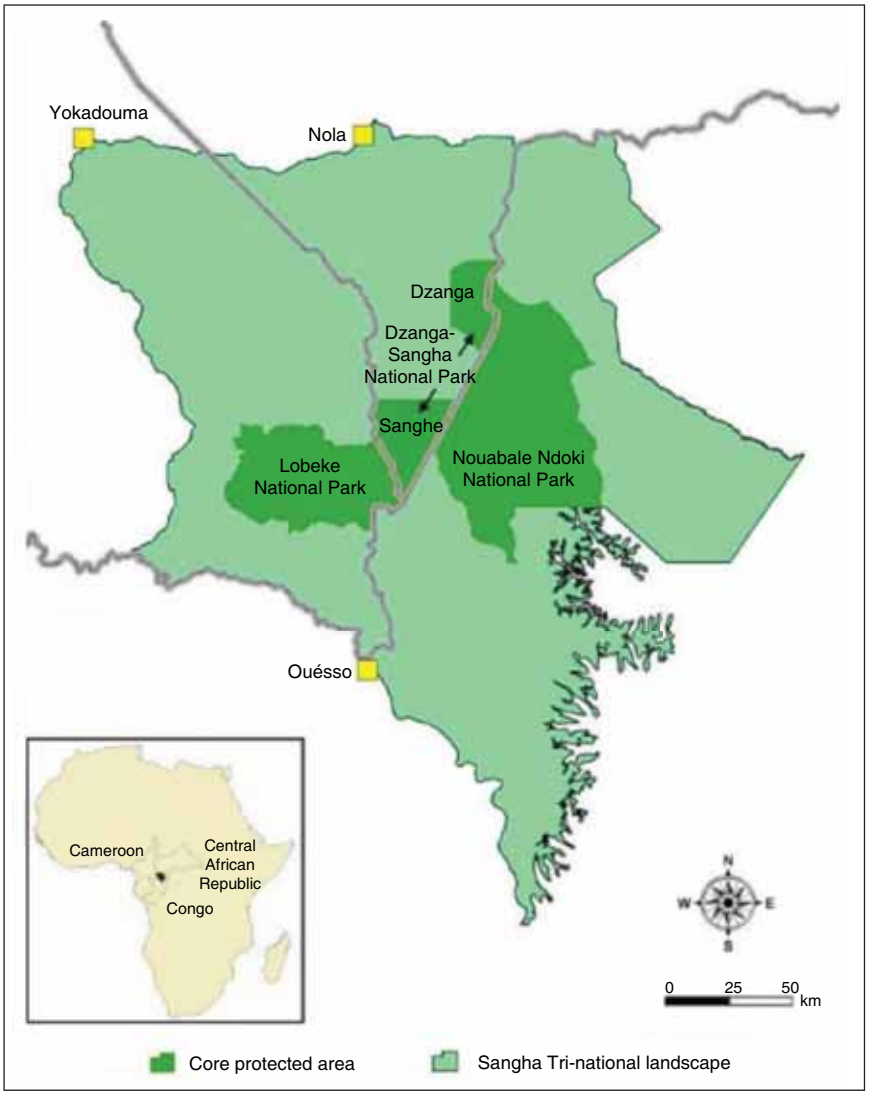
Isolated pockets of protected areas and forest patches alone do not allow for effective conservation of biodiversity, given increased pressures due to unsustainable exploitation practices in the multiple-use zones that surround them. Large blocks of natural habitat, on the order of millions of hectares are needed to maintain viable species populations for resilience to large-scale disturbances such as climate change. The large landscape conservation approach adopted in the Congo Basin is aimed at effective management of a network of protected areas along with promotion of sustainable use of natural resources in surrounding forests for economic development, livelihood support and the well-being of surrounding local communities.

Success in managing large-scale and complex initiatives that cut across international boundaries and national priorities depends on an enabling institutional environment, which must address national sensitivities and the geopolitical context in the subregion. The COMIFAC treaty signed by Central African leaders addresses some of the geopolitical and strategic issues, forging cooperation and the commitment of member countries to work together. COMIFAC is now a legal entity empowered by the governments to take decisions and formulate regional policies to promote sustainable management of natural resources in the Congo Basin. The treaty is also an important benchmark towards harmonization of regional forestry laws, policies and governance systems.

The Yaoundé process has been a catalyst for regional cooperation and more efficient management of natural resources in the Congo Basin. Both the commitment of Central African leaders and support from the international conservation community have been critical in its success. The existence of a Congo Basin treaty has stimulated bilateral and multilateral funding agencies to commit funding for the Congo Basin basket fund.

One of the unique characteristics of the Yaoundé process and Congo Basin con-

3
Sangha Tri-national landscape, with core protected area and multiple-use zones



servation initiative is the participatory nature in which the programme has been developed and is being implemented. It institutionalizes dialogue, participation and empowerment of stakeholders including local communities in land-use planning processes at grassroots levels, and as shown by the example of the Sangha Tri-national landscape described above, communities are benefiting.

The process has also demonstrated the value of rigorous scientific analysis in the development of large-scale conservation programmes. In the Congo Basin, priority landscapes and actions were determined following methodical assessment of the socio-economic and biological value of key sites.

Experiences and lessons learned from the Congo Basin would be useful for other regions confronted with similar problems, for example Latin America which also still has large areas of natural forest. ◆

Bibliography

Brunner, J. & Ekoko, F. 2000. Cameroon. *In* F.J. Seymour & N.K. Dubash, eds. *The right conditions: the World Bank, structural adjustment, and forest policy reform*, pp. 59–80. Washington, DC, USA, World Resources Institute.

Central Intelligence Agency (CIA), United States. 2007. *The World Factbook 2007*. Washington, DC, USA.

Congo Basin Forest Partnership (CBFP). 2006. *The forests of the Congo Basin – state of the forest report*.

Eves, H., Stein, J., Wilkie, D. & Bush Meat Crisis Task Force (BCTF). 2002. *The bush meat crisis in West and Central Africa*. Silver Spring, Maryland, USA, BCTF.

Hochschild, A. 1998. *King Leopold's ghost: a story of greed, terror, and heroism in colonial Africa*. New York, USA, Houghton Mifflin Company.

International Tropical Timber Organization (ITTO). 2004. *Annual Review and Assessment of the World Timber Situation 2003*. Yokohama, Japan.

Parenti, C. & Hanna, L. 2007. The fight to save Congo's forests. *The Nation*, 22 October. Available at: www.thenation.com/doc/20071022/parenti

Sayer, J.A. & Campbell, B.M. 2004. *The science of sustainable development: local livelihoods and the global environment*. Cambridge, UK, Cambridge University Press.

Wilkie, D.S., Sidle, J.G., Boundzanga, G.C., Blake, S. & Auzel, P. 2000. Defaunation or deforestation: commercial logging and market hunting in northern Congo. *In* R. Fimbel, A. Grajal & J.G. Robinson, eds. *The impacts of commercial logging on wildlife in tropical forests*. New Haven, Connecticut, USA, Yale University Press.

World Resources Institute (WRI). 2000. *An overview of logging in Cameroon*. Washington, DC, USA.

World Wide Fund for Nature (WWF). 2002. *Strategic planning – Western Congo Basin Moist Forest Eco-region*. Eco-region Technical Report. Libreville, Gabon, WWF Central Africa Regional Programme Office (CARPO).

WWF. 2008. *Global 200*. Internet document. Available at: www.nationalgeographic.com/wildworld/global.html ◆

Making sure that biofuel development benefits small farmers and communities

O. Dubois

Some suggestions on how to achieve biofuel development that favours sustainable rural livelihoods.

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Adapted from the author's paper "How good enough biofuel governance can help rural livelihoods: making sure that biofuel development works for small farmers and communities", an unpublished background paper for FAO's *State of Food and Agriculture 2008*.

The quest for sustainable biofuel systems has increased tremendously over the past few years. Concerns about potential negative effects, such as deforestation and competition between food and biofuel production, have led to the demand for sustainability instruments such as standards, criteria and indicators to be applied through mandatory regulations and/or voluntary schemes such as certification.

To ensure that biofuels contribute to the Millennium Development Goals, and in particular to the first goal on food security and poverty reduction, it is important to ensure that biofuel development at least does not harm, and preferably favours, the livelihood strategies of small-scale producers and communities in rural areas. This article addresses what it takes to achieve biofuel development that favours sustainable rural livelihoods.

Biofuel systems are complex because:

- they are inherently composed of three quite diverse components – feedstock (raw material) supply, conversion technology and energy use;
- these components are influenced simultaneously by environmental, economic and social factors;
- they can serve various purposes, from national energy supply to community-level energy autonomy;
- they function at different scales, from large-scale to decentralized village-based schemes.

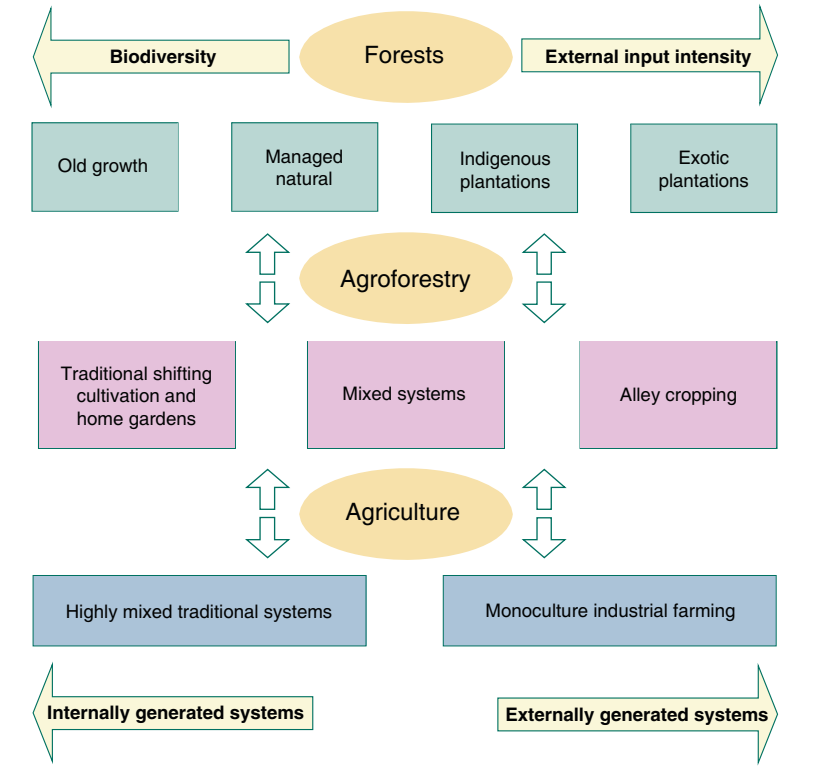
Biofuel development is also strongly influenced by current global trends such as transition to market economies, globalization, high and volatile fossil fuel prices and rising concerns about climate change. Yet biofuel development should be geared to people's livelihoods as well as to global and national energy needs. Livelihoods are sustainable (Ashby and Carney, 1999) when they:

- are resilient in the face of external shocks and stresses;
- are not dependent on external support (or if they are, this support should itself be economically and institutionally sustainable);
- maintain the long-term productivity of natural resources;
- do not undermine the livelihoods of, or compromise the livelihood options open to, others.

The article briefly discusses governance mechanisms that can ensure that small farmers and communities in rural areas do not lose out from the implementation of biofuel schemes.

SUSTAINABILITY IN UNCERTAIN TIMES AND CHANGING ENVIRONMENTS

Biofuel systems can be developed in diverse land-use situations (Figure 1). Conventional management methods are efficient in differentiating these land uses according to physical criteria. However, actual land uses change not only according to physical factors but also because needs change as demands



Source: Bass, Hawthorne and Hughes, 1998

1
Land-use spectrum as basis for biofuel development

from society, market opportunities and stakeholders' entitlements evolve. It is therefore important to consider the dynamics of land uses when assessing their environmental, economic and social impacts. Table 1 illustrates this through the different possible trajectories of forest cover, income and population density. In particular, it shows that different land cover trajectories are caused by and contribute to livelihood needs in different ways, and change over time.

It is increasingly accepted that modern policies and planning strategies regarding land use and natural resource management should account for "unpredictables" and "unknowns", hence uncertainty in land use and natural resource management (Dubois, 2003). They should be adaptive, following a learning process and involving continuous monitoring of the dynamics of environmental and socio-economic changes. And they should take into account the political dimension of land use and natural resource management, including power relationships, and develop approaches to deal with this dimension.

Uncertainty concerns not only ecological but also socio-economic circumstances, leading to different forms of vulnerability in rural areas. The aim of sustainable development should therefore be to manage, in time and space, change resulting from interactions among ecological, economic and socio-political factors.

HOW TO ADDRESS SUSTAINABLE BIOFUEL DEVELOPMENT IN PRACTICE

Approaches and instruments to achieve sustainable biofuel development can be characterized according to their mandatory or voluntary character as well as the scale of their application, as illustrated in Figure 2 (Van Dam *et al.*, 2006).

The performance of regulatory and voluntary instruments in terms of small farmers' and communities' livelihoods cannot yet be evaluated for biofuel development on a global scale because it is so recent, but lessons can be drawn from other types of land uses. Experience with forest resource management, for instance, has suggested that:

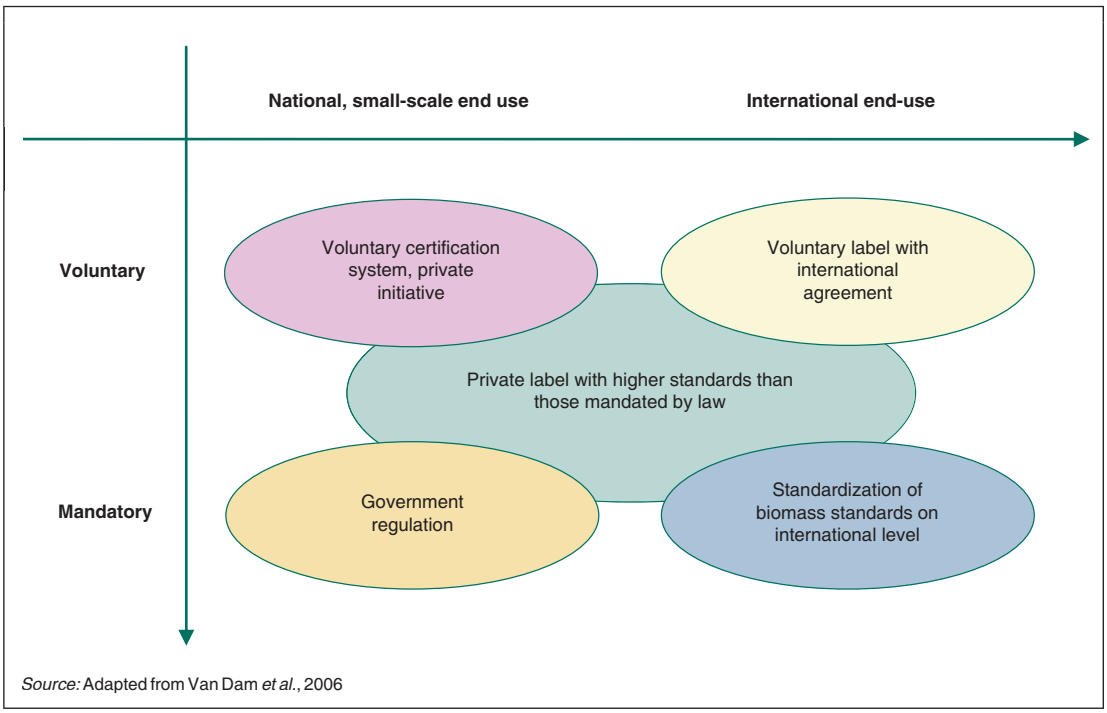
- "Control and command/fines and fences" strategies seldom work on the ground because they are not cost effective and are difficult to enforce.
- Collaborative strategies for sustainable resource management are more bound to achieve sustainable outcomes but they involve significant transaction costs (i.e. costs of interaction) in the short and medium term. Ways to reduce interaction costs include selecting key stakeholders according to their importance and influence, and involving representatives of stakeholder groups such as smallholder or community organizations in negotiating agreements (Dubois and Lowore, 2000; Abramovay and Magalhães, 2007).
- The use of voluntary schemes such as certification have primarily been driven from outside and often by donors. Subsidies provided by donors to help community enterprises obtain certification can undermine sustainable commercial decision-making by the enterprises. Although some communities value the non-market benefits of certification, such as recognition and credibility, the main driving force is the promise of greater market security. Without this security, communities may not continue with certification beyond an initial "honeymoon" period when support from donors and certifiers is at its highest (Bass *et al.*, 2001).

TABLE 1. Five possible trajectories of forest cover, income and population

Trajectory	Agricultural rent curve	Managed forest rent curve	Forest cover trend	Poverty and population trend	Location of identifying characteristic
Intensification with deforestation (e.g. soybean areas in Brazilian savannah)	Shifts up because of increasing urban or international demand for improved tenure	Is everywhere dominated by agricultural rent	Deforestation continues and stabilizes at low forest cover	Landowners prosper, labour demand probably increases, wages and/or workforces increase, with possible urban labour growth	Peri-urban, good soils, high-input agriculture and higher population density
Intensification with reforestation (e.g. woodlots)	Shifts up because of increasing urban demand, increasing returns and improved tenure	Shifts up because of increased demand, exhaustion of mined sources and demand for environmental services	Decreases, then rebounds	Landowners prosper, labour demand increases and wages and workforces increase	Peri-urban, medium to good soils, medium- to high-input agriculture and medium to high population density
Abandonment with regrowth (e.g. forests in Europe and the United States)	Shifts up because of increasing urban demand, then down because of rising wages	Shifts up because of improved tenure and increased demand for wood and environmental services	Decreases, then rebounds	Poverty decreases because of out-migration	Likely on marginal lands: hillsides and/or semi-remote forested land, or where population density is low
Abandonment and irreversible degradation (e.g. *Imperata* grasslands in Southeast Asia)	Shifts up and down because of land degradation	Never surfaces, either because of high costs or tenure or irreversibility of degradation	Decreases towards zero	Out-migration without poverty alleviation	Marginal lands, not near cities; nutrient-poor soils, slopes or highly fire-prone lands, grasslands in forest biomes
Deforestation and pauperization	Shifts up because of failing wages and increasing food demand	Shifts down because of soil degradation, and disputes over land tenure increase	Decreases towards zero	Larger but poorer population	Probably not near cities; anomalously high population density given remoteness and agroclimate

Source: Chomitz, 2006

2 Possible approaches to the implementation of policies for sustainable biofuel development



Source: Adapted from Van Dam *et al.*, 2006

Most of the current work on instruments for sustainable biofuel development is driven by voluntary initiatives (see Box below). These will have to be backed by the power of law and enforcement to have some chance of mitigating negative impacts of biofuel development. In many countries the judicial process is slow. Legal costs are often beyond the capacities of weaker groups in rural areas such as small-scale farmers and indigenous people, and enforcement of their rights may be hindered by links between powerful investors and political elites (UNDP, 2007).

COMMUNITY BIOFUEL SYSTEMS

Biofuel has significant potential to promote rural development (Box opposite), especially when it uses locally produced feedstock, through:

- wider and more on-demand availability of energy, with all its related services for local development (for households, communities and production purposes);
- job creation, both directly and indirectly, especially for biofuel projects based on agriculture, although this is usually limited in small-scale schemes and depends on the degree of mechanization of production and processing operations in large-scale schemes;
- provision of an alternative to other forms of agricultural production, thus contributing to income diversification;
- increased local revenue generation.

However, it is a challenge to develop biofuel systems that will truly satisfy local needs and contribute to poverty reduction and food security. For example, the connections among employment, environmental impacts and beneficiaries of the energy produced are strictly local and could be made clear to everyone, but this rarely happens when planning and implementation are supply driven and top-down. Moreover, rural energy should be part of a much broader development approach if it is to have positive and sustainable impacts on the rural poor.

The following ingredients seem essential for successful community biofuel development projects that fulfil local needs (UNDP, 2000; Forsyth, 2005):

- participatory approaches involving a broad cross-section of the community, including the poorest groups;
- inclusion of production and supply of biomass as an integral part of the project (because the entire biofuel chain affects the local community) and sensitivity to other possible uses of feedstock (e.g. as food, fodder, soil amendment or fertilizer, construction material);
- minimized transaction costs, as described above;
- assurance mechanisms, such as contracts and understandings, to keep the community and private biofuel processors together in partnership;
- fostering of a local institution to take responsibility for design, implementation and ongoing management of the project;
- appropriate financial mechanisms.

Getting the financial mechanisms right is especially crucial and complex when dealing with the rural poor. Subsidies should be transparent and linked to the economic development they are supposed to promote (UN-Energy, 2007).

WHAT CAN GOVERNMENTS DO TO SUPPORT SUSTAINABLE BIOFUEL DEVELOPMENT?

The role of government can include, for example (ESMAP, 2005; Dubois and Lowore, 2000):

- providing an overall strategic vision for biofuel development;
- developing a series of policies related to biofuel development (Table 2), including incentives and removing disincentives – although to date the effect of most biofuel policies on consumers' food surplus situation and on greenhouse gas reduction remains uncertain;
- providing guidance in such areas

Example of a multistakeholder process: the Roundtable on Sustainable Palm Oil guidance for smallholders

The Roundtable on Sustainable Palm Oil (RSPO) (see www.rspo.org) is a global association of organizations promoting open dialogue throughout the palm oil supply chain, involving oil-palm growers, palm-oil processors and traders, consumer goods manufacturers, retailers, banks and investors, environmental and nature conservation non-governmental organizations (NGOs) and social and development NGOs.

The focal activity of RSPO has been the development of practicable principles and criteria for production of sustainable palm oil. Its strengths include its transparent, inclusive, consensus-based process, and its rapid progress in developing and field-testing the principles and criteria.

To encourage the engagement of smallholders, smallholders' organizations, non-company extension services and growers' associations, RSPO formed a Smallholder Task Force which works to:

- **ensure that the association's materials are translated into the major languages of the main countries where smallholders engage in oil palm cultivation;**
- **carry out diagnostic surveys of smallholder issues and views;**
- **test the RSPO principles and criteria with smallholders;**
- **hold open consultations;**
- **propose revised principles and criteria to RSPO.**

Source: Vermeulen and Goad, 2006; RSPO, 2007.

Example of a community biofuel development scheme: fostering jatropha biofuel in Malian villages

Mali is among the poorest countries in the world and has a highly unequal income distribution. It is land-locked and has few export opportunities. Sixty-five percent of the land area is desert or semi-desert, and 99 percent of the rural population lacks energy services, which are vital to increase productivity, add value to agricultural produce, increase income and enable rural people to escape from poverty.

A 15-year project in the township of Garalo aims set up electricity generators fuelled by jatropha oil for 10 000 people and to reduce village poverty. The population is mainly engaged in agriculture (mostly millet, sorghum and rice, as well as cotton for income generation), raising cattle and fishing. Electricity is required to pump water for irrigation, to operate agricultural processing equipment, to chill vegetables and for lighting and refrigeration services in small shops and restaurants. Jatropha (mainly *Jatropha curcas*) is well known in Mali where it is used for protective hedges, erosion control and traditional soap-making. The project will implement 1 000 ha of plantations of jatropha and other oil-producing plants and will provide training at different levels to ensure quality of the processed oil. Expected environmental benefits include carbon-dioxide emission savings of 9 000 tonnes per year as well as protection of soil against erosion to combat deforestation and desertification.

In the village of Tiécourabougou, the Mali-Folkcenter Nyeeta, a Malian non-governmental organization, has launched "energy service centres" based on jatropha. Some 20 ha of plantations grow seeds to produce jatropha oil for uses such as millet grinding and battery charging by villages within a 20-km radius.

The money spent on locally grown fuel stays in the community to stimulate the local economy. On a macro-economic level, this implies a reduction of the country's expenses on imported fossil fuels, saving hard-earned foreign currency reserves.

Source: FACT, 2007; UN-Energy, 2007.

as possible environmental changes, market identification, legal compliance, quality control and information dissemination;

- providing financial assistance to complement the mobilization of local resources;
- clarifying territorial rights and providing a legal framework for their recognition;
- protecting against pressures from other economic sectors;
- providing and maintaining basic infrastructure to support biofuel product development and marketing;
- providing formal rules for conflict resolution if local rules are insufficient;
- linking different decision-making levels;
- creating and enforcing regulations (giving heed to local needs) in those situations where local activity has an impact on a wider community and local approaches will not secure the interests of more distant communities (as in watershed management, for example).

STRATEGIES AND TOOLS TO GET STAKEHOLDERS' ROLES RIGHT

Trade-offs between different interests will often have to be made at the interface between sustainable biofuel development and sustainable livelihoods. The key question is who wins and who loses from biofuel development, with a particular emphasis on making sure that disadvantaged rural groups do not lose out. Successfully addressing this question requires the development of "good enough" local governance mechanisms (both formal and informal) that ensure adequate and sustained bargaining power for these groups.

A matrix comparing the environmental, agronomic, socio-economic and policy aspects of alternative land-use systems, produced by the Alternatives-to-Slash-and-Burn Programme, helps understand the trade-offs between different land-use options according to different interests and concerns (Table 3). Such a matrix could easily be adapted to assess different biofuel development options as a basis for multistakeholder negotiation.

An illustrative pyramid of governance elements necessary to achieve sustainable forest management (Mayers, Bass and

TABLE 2. Types of policy tools and some examples

Type of policy	Some examples
Incentive – tax or subsidy	Excise tax credit for renewable energy, carbon tax, subsidies for flex fuel vehicles, price supports and deficiency payments, tariffs or subsidies on imports/exports
Direct control	Renewable fuel standards, mandatory blending, emission control standards, efficiency standards, acreage control, quotas on import/export
Enforcement of property rights and trading	Cap and trade
Educational and informational programmes	Labelling
Improving governance	Certification programmes
Compensation schemes	Payment for environmental services

Source: Rajagopal and Zilberman, 2007

Macqueen, 2005) is also applicable to sustainable biofuel development (Figure 3). The lower tiers (basic policy and institutional elements) push, while the higher tiers (more sophisticated mechanisms that generate demand) pull, for sustainable biofuel development. Elements in the lower tiers are more numerous and often more fundamental to progress.

The pyramid's foundations are less directly controlled by biofuel stakeholders, but it is crucial that these stakeholders understand the constraints and opportunities emanating from beyond the biofuel sector to enable them to argue their case and influence those with the power to improve the foundations.

Taking the construction analogy further, Mayers, Bass and Macqueen (2005) suggest five "plumbing and wiring systems" as necessary complements to the building stones:

- information (access, coverage, quality, transparency);
- participatory mechanisms (representation, equal opportunity, access);
- finances (internalising externalities, cost efficiency);
- skills (equity and efficiency in building social and human capital);
- planning and process management (priority-setting, decision-making, coordination and accountability).

The involvement of local communities and small farmers in the co-management of biofuel systems should be an important principle of biofuel policies and practice, and a major component of international biofuel aid programmes. However, in other natural resource sectors (e.g. forestry) and rural development, the initial enthusiasm for this principle has been tempered by experience and recognition of the challenges it presents – providing a lesson for biofuel development. These challenges include:

- political and institutional issues underlying natural resource management;
- the importance of context;
- the difficulty of reducing specificity to the community level because rural populations are often composed of many separate groups, people use natural resources in different ways, and external actors influence the local rules of resource use and management.
- institutional transition in natural resource management, often including weakened traditional rules, increasing privatization and non-enforceability of formal rules.

A multiple strategy is therefore required, combining:

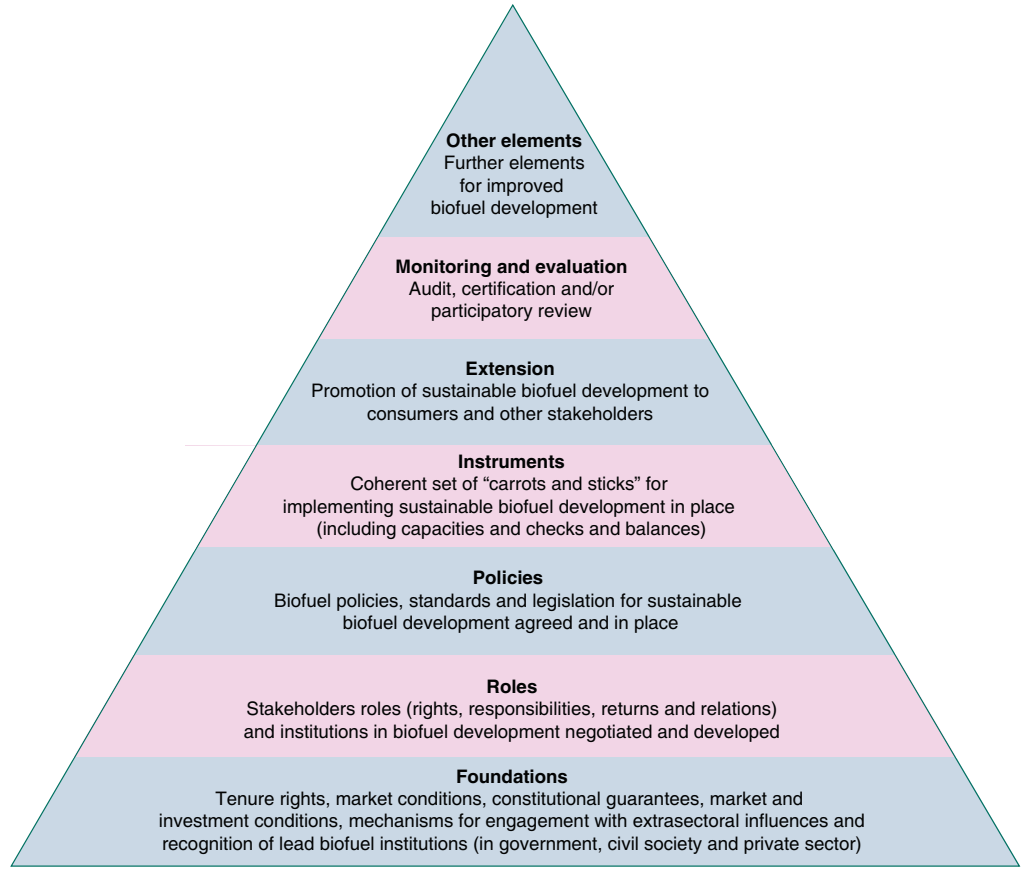
- national guidelines that clearly recognize the key role of communities and small farmers in achieving simultaneously better biofuel development and sustainable rural livelihoods;
- continuous potential for negotiation of the terms and conditions of the collaborative natural resource management agreement, particularly concerning the "four Rs" – rights, responsibilities, returns and mutual relationships – of stakeholders (Mayers, 2005);
- experimentation and monitoring of collaborative management involving rural people, and development of mechanisms that allow lessons from experimentation to feed into the policy-making process;
- long-term and demand-driven donor support to help in financing the transaction costs of this learning process;
- a flexible and iterative approach, following guidelines not blueprints.

Ultimately, policy implementation, institutions and stakeholders' roles in biofuel development are all embedded in the local political and cultural context. Policies may address the issue of what is needed at the natural resource level, but it is the interactions between the assets, needs, institutions and relationships that determine how policies are to be implemented. This is therefore the level where capacity development should be given priority. The argument about ways to implement biofuel development usually concerns stakeholders' assets and entitlements, and other local institutions, but

TABLE 3. Matrix comparing the environmental, agronomic, socio-economic and policy/institutional aspects of alternative land-use systems

Land-use systems	Global environmental concerns		Agronomic sustainability concerns	Smallholders' socio-economic concerns		Policy and institutional issues
	Carbon sequestration (above-ground, (time-averaged) *(tonne/ha)*	Biodiversity (above-ground) *(plant species per plot)*	Plot-level production sustainability (overall rating)	Potential profitability (returns to land) *(US$/ha)*	Employment (average labour input) *(days/ha/year)*	Production incentives at private prices (returns to labour) *(US$/day)*
Forests						
Complex agroforests						
Simple agroforests						
Crop-fallow rotations						
Continuous annual crops						
Grassland, pastures						

Source: Palm *et al.*, 2005



Source: Adapted from Mayers, Bass and Macqueen, 2005

3
Illustrative pyramid of necessary governance elements for sustainable biofuel development

progress often hinges on the quality of local stakeholders' relationships, local politics and culture, and the influence of outside pressures, in short the balance of different interest groups. ◆

Bibliography

Abramovay, R. & Magalhães, R. 2007. *The access of family farmers to biodiesel markets: partnerships between big companies and social movements*. São Paulo, Brazil, University of São Paolo. Available at: www.regoverningmarkets.org/en/global/innovative_practice.html

Ashby, C. & Carney, D. 1999. *Sustainable livelihoods: lessons from early experience.* London, UK, Department for International Development (DFID).

Bass, S., Hawthorne, W. & Hughes, C. 1998. Forests, biodiversity and livelihoods: linking policy and practice. Issues paper for DFID. London, UK.

Bass, S., Thornber, K., Markopoulos, M., Roberts, S. & Grieg-Gran, M. 2001. *Certification's impacts on forests, stakeholders and supply chains: instruments for sustainable private sector forestry series*. London, UK, International Institute for Environment and Development (IIED). Available at: www.iied.org/pubs/pdf/full/9013IIED.pdf

Chomitz, K.M. 2006 *At loggerheads? Agriculture expansion, poverty reduction and environment in the tropical forests*. Washington, DC, USA, World Bank.

Dubois, O. 2003. Trade-offs between conservation and development in forestry – Setting the stage and some guiding principles. Voluntary Paper for the XII World Forestry Congress, Quebec City, Canada, 21–28 September 2003.

Dubois, O. & Lowore, J. 2000. *The journey towards collaborative forest management in Africa: lessons learned and some navigational aids: an overview*. London, UK, IIED.

Energy Sector Management Assistance Program (ESMAP). 2005. *Advancing biofuel for sustainable development – guidelines for policy makers and investors*. 3 Vols. Washington, DC, USA, World Bank.

Forsyth, T. 2005. *Partnerships for technology transfer – how can investors and communities build renewable energy in Asia?* Sustainable Development Programme Briefing Paper SDPBP 05/01. London, UK, Chatham House.

Fuels from Agriculture in Communal Technology (FACT). 2007. *Rural electrification in Mali – Project description.* Internet document. Available at: www.fact-fuels.org/en/FACT_Projects/Mali

Mayers, J. 2005. *The four Rs.* Power Tools Series. London, UK, IIED. Available at: www.policy-powertools.org/Tools/Understanding/docs/four_Rs_tool_english.pdf

Mayers, J., Bass, S. & Macqueen, D. 2005. *The pyramid: a diagnostic and planning tool for good forest governance*. Power Tools Series. London, UK, IIED. Available at: www.policy-powertools.org/Tools/Engaging/docs/pyramid_tool_english.pdf

Palm, C.A., Vosti, S.A., Sanchez, P.A. & Ericksen, P.J., eds. 2005. *Slash-and-burn agriculture: the search for alternatives*. New York, NY, USA, Columbia University Press.

Rajagopal, D. & Zilberman, D. 2007. *Review of environmental, economic and policy aspects of biofuels*. Policy Research Working Paper 4331. Washington, DC, USA, World Bank.

Roundtable on Sustainable Palm Oil (RSPO), Task Force on Smallholders. 2007. *RSPO principles and criteria for sustainable palm oil production*. Consolidated 2nd draft: Guidance on smallholders.

United Nations Development Programme (UNDP). 2000. *Biofuel primer – modernised biomass energy for sustainable development*. New York, NY, USA.

UNDP. 2007. *Human Development Report 2007/2008. Fighting climate change: human solidarity in a divided world.* New York, NY, USA.

UN-Energy. 2007. *Sustainable biofuel: a framework for decision makers*. New York, NY, USA, United Nations.

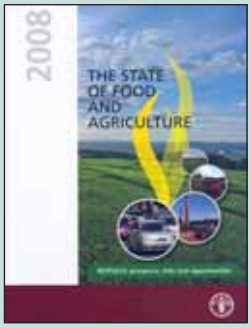
Van Dam, J., Junginger, M., Faaij, A., Jürgens, I., Best, G. & Fritsche, U. 2006. Overview of recent developments in sustainable biomass certification. Paper written in the frame of International Energy Agency (IEA) Biofuel Task 40.

Vermeulen, S. & Goad, N. 2006. *Towards better practice in smallholder palm oil production*. Natural Resource Issues Series No 5. London, UK, IIED. Available at: www.iied.org/pubs/pdf/full/13533IIED.pdf ◆

Do biofuels help mitigate climate change?

The 2008 edition of FAO's annual flagship publication *State of Food and Agriculture* focuses on prospects, risks and opportunities from biofuels. It raises issues of important interest to forestry – notably questioning the usual assumption that replacement of fossil fuels with fuels generated from biomass will necessarily reduce greenhouse gas emissions.

Greenhouse gases are emitted at many stages in the production of bioenergy crops and biofuels (including in production of agricultural inputs, fertilizer application, chemical processing and transport of biofuels). Moreover, they are emitted by land-use changes directly or indirectly triggered by increased biofuel production, for example when carbon stored in forest or grasslands is released during conversion to crop production. While maize produced for ethanol can generate greenhouse gas savings of about 1.8 tonnes of carbon dioxide per hectare per year, the conversion of



forest land to produce these crops can release 600 to 1 000 tonnes per hectare.

One study estimated that the conversion of tropical moist forest, peatland, savannah or grassland to produce ethanol and biodiesel in Brazil, Indonesia, Malaysia or the United States of America releases at least 17 times as much carbon dioxide as those biofuels save annually by replacing fossil fuels.

Another study concluded that in comparison with carbon emissions avoided by growing sugar cane, maize, wheat, sugar beet and rapeseed for ethanol and biodiesel on existing cropland, more carbon would be sequestered over a 30-year period by converting the cropland to forest.

State of Food and Agriculture 2008 notes that while biofuels are an important option for reducing greenhouse gas emissions, in many cases improving energy efficiency and conservation, increasing carbon sequestration through reforestation or changes in agricultural practices, or using other forms of renewable energy can be more cost-effective.

The complete text of *State of Food and Agriculture 2008* including references to the studies cited here is available online at: www.fao.org/docrep/011/i0100e/i0100e00.htm

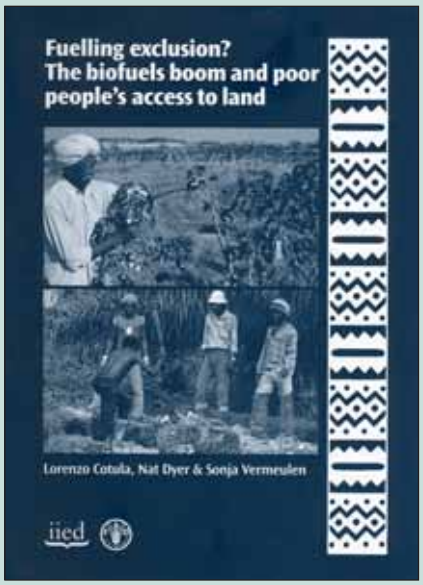
The recent FAO publication *Forests and energy: key issues*, reviewed on p. 56 of this issue, provides additional perspectives on the complex relations among biofuels, agriculture, forests and climate change.

What effect will biofuels have on forest land and poor people's access to it?

A study recently published by the International Institute for Environment and Development (IIED) and FAO, *Fuelling exclusion? The biofuels boom and poor people's access to land* (L. Cotula, N. Dyer and S. Vermeulen, 2008) examines the implications of the spread of commercial planting of biofuel crops for land use and access in producer countries. The authors note that higher crop yields per unit area and more efficient processing alone cannot be expected to supply the rapidly growing demand for biofuel feedstock (raw materials). The following are some of the observations made or cited in the study.

Large-scale conversion of forest and conservation areas to biofuel crops are predicted. Indeed vast land use changes from forest to cash crops have already occurred. The authors cite the spread of oil palm in Indonesia, for example, which has resulted in the clearance of 18 million hectares of forest over the past 25 years, although only 6 million hectares were planted to oil palm by 2006.

According to the International Energy Agency, in 2006 an estimated 14 million hectares of land were used for the production of biofuels and by-products, approximately 1 percent of globally available arable land. At the global level, projected growth in biofuel production to 2030 could require from 35 million to 54 million hectares of land (2.5 to 3.8 percent of available arable land) depending on the policy scenario. It has also been predicted that even with modest greenhouse gas regulations, 1.5 billion hectares, equivalent to current total global farmland, could be under biofuel crops by 2050.



How much land is available to meet these needs? A large proportion of the world's land surface is unsuitable (too dry, cold, steep and/or nutrient poor) for cultivation. The Global Agro-ecological Assessment estimated that worldwide 2.5 billion hectares are "very suitable" or "suitable" for cultivation, and a further 784 million hectares are "moderately suitable". In Asia, Europe and North America, almost the entire cultivable area is either under cultivation or under forest in which cultivation would have "severe environmental consequences". In these regions, expansion of biofuel crops can only come about as a substitution for other crops or through expansion into forest areas.

Thus about 80 percent of the world's reserve agricultural land is Africa and South America, where total cultivable land is estimated to be 807 million and 552 million hectares respectively (all three suitability categories minus land under forest). About 227 million and 183 million hectares of this land, respectively, are already under cultivation. However, the authors note that if land under shifting cultivation and fallow systems is not already included in these measurements, the total "cultivated" land in Africa could be as much as 1 135 million hectares – well above the alleged available reserves. Despite high levels of uncertainty, it is clear that reserves of land with high agricultural potential are extremely limited. About half of the cultivable land reserves are in just six countries: Angola, Argentina, Bolivia, Colombia, the Democratic Republic of the Congo and the Sudan.

Most policies advocate planting of biofuel crops on "marginal" lands. If the above-mentioned "moderately suitable" lands are considered marginal, the world has 610 million hectares of unforested marginal land. Another estimate gives the total global area of degraded land, defined as formerly forested tropical lands not currently used for agriculture or other purposes, as 500 million hectares (100 million each in Asia and South

America and 300 million in Africa). Current abandoned agricultural land could be 386 million hectares globally.

Several governments have taken steps to identify idle, underutilized, marginal or abandoned land and to allocate it for commercial biofuel production. In Indonesia, for example, the Department of Agriculture has reported that there are approximately 27 million hectares of "unproductive forest lands" that could be offered to investors and converted into plantations. However, there are likely to be major obstacles to commercial production of biofuels on marginal lands, and overuse of marginal land can result in long-term or permanent ecological damage such as salination or severe erosion. Use of these lands also has social implications. In many cases, the livelihoods of poor and vulnerable groups depend on lands perceived by governments or private operators as marginal (e.g. for crop farming, herding and gathering of wild products). In India, for instance, jatropha is widely planted on "wasteland" that rural people rely on for fuelwood, food, fodder, timber and thatch.

The tenure status of such lands may be complex, with governments asserting landownership but exercising little control at local level, and local groups claiming resource rights based on customary tenure systems that may not be legally enforceable. In southwestern China, for example, where provincial governments plan to expand jatropha to 1 million hectares of "barren" land over the next decade and a half, possibly as much as three-fourths of this land is owned not by the State but by village collectives, with use rights granted to individual households. Most private investment in biofuels has so far been limited to State-owned land, but the ambitious targets for scaling up jatropha production are likely to result in problems of land availability and extension of cultivation to collective lands.

Besides direct impacts on land tenure, production of biofuel crops may have more subtle implications for access to land-based resources. For example, substitution of a biofuel crop for a food crop might exclude landless people from post-harvest gleaning; husbands might appropriate land from their wives if it is uesd for cash crops rather than subsistence; and fallow periods may be shorter, meaning less land for communal livestock grazing.

In large part the impact of biofuels on land access is likely to result from increased land values and the potential for higher economic returns. The authors note that although much of the impact will be exclusionary and negative, biofuel cultivation may also strengthen land access for some poor land users, by renewing people's interest and investment in land and encouraging small-scale farmers to seek more secure tenure over their land resources. For example, in South Africa women have planted tree crops for future biofuel use specifically to secure their claims over land contested by their late husbands' families.

A range of policies and processes can influence linkages between biofuels and land access – international (international commodity prices, trade barriers for biofuels), national (policy and legal frameworks on biofuels and on land tenure) and local (balancing of traditional and formal land rights). Some of these (e.g. national policies to promote expansion of export-oriented feedstock plantations or power asymmetries between current small-scale land users and prospective large-scale interests) may exacerbate loss of land access by poor people and small-scale land users. However a growing assemblage of good practices and innovative business approaches seeks to promote more equitable and sustainable land management.

Civil society also has a role in protecting the environment, land rights and human rights from possible misuse associated with biofuels. In Uganda, allocation of national forest reserves in Bugala and Mabira to foreign plantation companies for establishment of palm-oil and sugar-cane plantations elicited demonstrations in Kampala, court cases led by non-governmental organizations, a sugar boycott, petitions and a mobile-phone messaging campaign. The Ugandan Government subsequently withdrew plans to convert the Bugala forest reserve to sugar cane.

For the sources of information cited in this article, see the full text of *Fuelling exclusion? The biofuels boom and poor people's access to land*, available at: www.iied.org/pubs/pdfs/12551IIED.pdf

Towards certification of wild medicinal and aromatic plants in four Indian states

P. Bhattacharya, R. Prasad, R. Bhattacharyya and A. Asokan

An innovative attempt to create a standard for certifying forest-based medicinal and aromatic plants (MAPs) by adapting global norms for national-level implementation.

Prodyut Bhattacharya, Ram Prasad, Rajasri Bhattacharyya and **Aparna Asokan** work at the International Centre for Community Forestry, Indian Institute of Forest Management, Nehru Nagar, Bhopal, Madhya Pradesh, India.

The safety and affordability of natural products as medicines, food, cosmetics and pesticides has led to a resurgence of interest in medicinal plants. Globally, wild or natural resources meet 70 to 90 percent of the market demand for medicinal and aromatic plants (MAPs), also ensuring the livelihoods of millions of rural people (Prasad and Bhattacharya, 2003). However, the recent increment in commercial demand is a threat to natural MAP resources if they are not managed to safeguard their regeneration. The threat is further intensified by forest degradation, land conversion, anthropogenic disturbances and other factors. Cultivation and domestication of wild plants is often suggested as a way to meet the growing market demand and also to create a balance between the use and conservation of MAPs, but for many species knowledge and practices are not yet advanced enough to bridge the gap between demand and supply, and it may not be economical to develop these practices. Furthermore, there are indications that some wild materials may have greater amounts of active constituents than their cultivated counterparts (Schippmann, Leaman and Cunningham, 2006).

Traditional users have emphasized good collection, storage and maintenance practices to ensure the quality of medicine prepared from plants. However, with expansion of the pharmaceutical industry and growing preference for herbal and organic products, the rapid depletion of natural MAP resources necessitates international and national regulations and guidelines to guarantee that sustainable practices are followed.

India has a rich tradition of medicinal plant use and conservation supported by socio-cultural practices such as worship of plants and animals and protection of sacred groves. However, indiscriminate collection of MAPs from wild sources has depleted these resources. Meanwhile, privately driven exploitative marketing has deprived MAP gatherers of their due remuneration (Verma, 1998). Although forests have a vital role in the national economic scenario, until recently MAPs (and non-wood forest products [NWFPs] in general) received little attention in forest-based strategic planning and development.

MAP certification could have potential for addressing these problems. Certification can be briefly defined as a market-based incentive for good management practices. Forest certification originally dealt mainly with timber production, but it has increasingly addressed NWFPs as they have gained in economic importance (Brown, Robinson and Karman, 2002).

Direct benefits of MAP certification include secured future availability of the resources through sustainable collection, improved quality leading to a price premium, and market expansion through international acceptance. These lead to indirect benefits such as conservation of biodiversity, respect for traditional rights and practices, improved benefit sharing (which can enhance the returns of gatherers and thus motivate them to conserve, manage and collect MAPs responsibly, and also to comply with policy and law) and socio-economic development. In short, MAP certification can benefit not only forest populations that rely on MAPs, but also a wider group of stakeholders

ICCF, IIFM

Testing of quality parameters of medicinal plants by a herbal industry at Indore, Madhya Pradesh; one of the direct benefits of MAP certification is improved quality leading to a price premium

(Sindhi and Choudhury, 2003). In comparison with timber certification, however, certification of wild medicinal plants and other NWFPs requires more specific and detailed methodology, research and planning because of the variety of products and seasonality involved (Pierce and Laird, 2003; Pierce, Shanley and Laird, 2003).

The International Centre for Community Forestry (ICCF) in Bhopal, India has recently undertaken a project to evaluate the potential for MAP certification and to develop a generic standard for it, covering stages from raw material collection to marketing. Sponsored by the National Medicinal Plant Board, the MAP Certification Standard Development project covers four Indian states where MAP resources are socio-economically important and a suitable institutional framework is in place: Madhya Pradesh, Chhattisgarh, Orissa and Uttarakhand.

The project reviewed practices in the selected states, as well as existing international and national guidelines for MAPs in light of Indian conditions. A draft certification standard was developed through stakeholder consultations organized in each state. This article presents the preliminary findings and the draft standard.

REVIEW OF CURRENT SITUATION AND PRACTICES

Practices in each of the four states were reviewed according to the following parameters: existing legal and policy framework, conservation activities, prevalent collection and trade practices, and benefit sharing and livelihood security. These parameters eventually formed the principles of the draft standard.

Data were collected and verified through field survey and interviews with different stakeholders such as gatherers, traders, foresters and local non-governmental organizations (NGOs). The main findings (ICCF, 2007) are outlined here.

Legal and policy framework

Although the financial and developmental importance of MAPs is recognized, a legal and policy framework for them is yet to be developed. NWFP and MAP policies vary widely from state to state (Sahu, 2002; IIFM, 2007).

The subsistence use rights accorded to villagers, for example, vary by state. National legislation enacted in 1996 to facilitate participatory democracy in tribal areas gives villages the power to manage and control their own resources, including NWFPs. However two related acts in Madhya Pradesh fail to mention NWFPs (Ojha, 2004).

The State Forest Policy of Chhattisgarh, issued in 2001, declares that the state will take appropriate measures through the Chhattisgarh State Minor Forest Produce (Trade and Development) Co-operative Federation Ltd (CG MFP Federation) for sustainable utilization and long-term conservation of all NWFPs from the forests of the state. The recently proposed Chhattisgarh Medicinal Plant Bill of 2007 states that only *bona fide* village

Interview with women collectors of NWFPs regarding collection practices, Chhattisgarh

ICCF, IIFM

residents may collect medicinal plants in the village area. However, there is no mention of what is to be done in the case of illegal entry or collection. Neither Madhya Pradesh nor Chhattisgarh controls commercial collection organized by traders or their agents.

In Uttarakhand, villagers can use community forest products, but the state Forest Department has authority over commercial utilization. In Orissa, however, village councils are empowered to regulate the purchase (from primary gatherers), procurement and trade of 69 NWFPs (referred to as "minor forest products"). People engaging in these activities must register with the village council; but the quality and quantity of collection is generally unregulated (*Orissa Gazette*, 2002).

As a conservation framework, Madhya Pradesh and Chhattisgarh initiated a Peoples Protected Area approach to involve local people in protection and conservation of valuable forest resources in resource-rich areas, with benefit sharing (Chhattisgarh Forest Department, 2007). In Madhya Pradesh a rotational ban is implemented on different products in different areas to promote resource conservation. However, it is not clear how these provisions are being implemented at the field level, as monitoring results are not available. Uttarakhand has adopted a unique strategy for scientific management of MAPs involving rapid inventory and mapping of MAPs following division of each forest range into three separate management units for conservation (no commercial extraction allowed), development (intensive management and cultivation) and sustainable harvesting (Planning Commission, Government of India, 2006).

Madhya Pradesh, Orissa and Chhattisgarh have systems for registering collectors. One district of Chhattisgarh has made an attempt to issue identity cards to MAP collectors through village Joint Forest Management Committees (Katiyar, 2007).

ICCF, IIFM

Participatory assessment of medicinal gum yielding tree, Madhya Pradesh

Most of the states have a transit permit system. Transit permits help forest departments record outgoing forest products and collect tax revenues from traders. They also support sustainable forest management by providing valuable information on forest product collection and commercialization. In Madhya Pradesh, however, minerals, wildlife, *tendu patta* (*Diospyros melanoxylon* or Indian ebony leaves), *sal* (*Shorea robusta*) seeds and *kullu* (*Sterculia urens*) gum are the only NWFPs subject to transit permits (*Madhya Pradesh Gazette*, 2005).

WILD AREA CONSERVATION AND MANAGEMENT

Most forest management plans, working plans or microplans address forest resources as a whole. While they generally include MAPs as a category, MAP-specific planning is rare (Misra and Jain, 2003) – although the national government recently initiated a process to incorporate MAPs in the Forest Working Plan Code for better management at the forest management unit level (Bhattacharya, 2008).

State and local organizations have mapped resources in some MAP-rich areas; however, few of these studies apply improved technologies for ground-based or aerial mapping and documentation, and few involve local stakeholders in a truly participatory way. Although biodiversity and vegetation mapping has been carried out through remote sensing in all four states, these maps are not used for strategic planning or implementation of MAP conservation activities (Bhattacharaya, 2006).

Threat status assessment of prioritized species has been reported from Madhya Pradesh and Chhattisgarh (Ved *et al*., 2003), but study of the ecology of MAP species and the impact of overharvesting has been insufficient to contribute much to conservation and management planning.

State forest departments and medicinal plant boards have a significant role in conservation and management of medicinal plants in forest areas, undertaking *in situ* and *ex situ* conservation projects. Statewide and local organizations have undertaken cultivation-based conservation initiatives such as nursery development and herbal gardens, but these need

to be strengthened through development of people's awareness, incentives and market linkages. State initiatives tend to be hindered by personnel and management deficiencies and failure to monitor and assess their results.

Responsible collection and use practices

Despite awareness of the importance of sustainable harvesting, many collectors adopt destructive harvesting practices, compelled to do so by poor economic conditions, population pressure, consequent resource use competition and market demand for MAPs. Research organizations (e.g. the Tropical Forest Research Institute and State Forest Research Institute, Jabalpur; the Foundation for Revitalising Local Health Tradition, Bangalore; and the Indian Institute of Forest Management, Bhopal) and local agencies are working to systematize sustainable harvesting techniques and methods through field research and capacity building programmes for collectors, traders and forestry field staff, but their research findings are poorly disseminated and therefore not widely implemented (Prasad, Kotwal and Mishra, 2002; Bhattacharya and Hyat, 2004; Lawrence, 2006). Although governmental and non-governmental organizations regularly conduct awareness and training workshops on sustainable harvesting of MAPs, these efforts do not appear to have translated into sustainable harvesting practices in the field.

Collectors pay little attention to quality and continue to collect prematurely since the currently used grading system (mostly controlled by traders) and market demand put a price even on inferior material (Durst *et al.*, 2006). Quality control in local and regional markets is weak, relying mainly on personal experience, and often fails to exclude adulteration. Although chemical analysis of raw material is gaining wider acceptance, lack of local facilities restricts its implementation at the field level. Manuals or standardized rules for quality control are generally lacking.

Lack of nearby storage facilities often compels primary collectors to sell their materials directly to local agents or traders, and improper maintenance practices during storage shortens shelf life and may diminish the quality of the material. However in some areas of Chhattisgarh and Madhya Pradesh local MAP storage facilities have been established and have improved economic returns for the collectors.

Documentation related to collection, storage and traceability of MAP materials is still rare.

Benefit sharing and livelihood security

An effective marketing strategy is the most important requirement for development of the MAP sector in India. Powerful private traders' networks often hinder development in this field. Lack of state support or an organized system enables the spread of these traders' influence even in remote areas. Most stakeholders would prefer to see this problem addressed through a facilitating marketing framework rather than through regulation. Several organizations (e.g. Madhya Pradesh Minor Forest Produce Federation, Madhya Pradesh Forest Department, Uttarakhand Forest Development Corporation, CG MFP Federation, Chhattisgarh Forest Department) have undertaken initiatives to facilitate market access, for example by forming cooperatives and organizing opportunities to bring together buyers and sellers such as fairs and exhibitions. Stakeholders have also proposed the development of an electronic marketing and information system, a concept which is being taken up by the National Medicinal Plant Board.

Although individuals are still the prevalent collectors in many areas, cooperatives and federations are now becoming important at the state level and facilitate benefit sharing. A good example is the Village Satawar Committee in Sheopur district of Madhya Pradesh, where satawar (*Asparagus racemosus*) is one of the main sources of income for villagers. The committee is responsible for satawar collection, storage and marketing, and its profits are distributed among the collectors (Bhattacharya, 2006).

Pricing strategy for MAPs is another point of concern because of the unstable nature of demand-based supply, quality and availability of material. At present, pricing is mostly controlled by traders with no regard for benefit sharing. Some products (e.g. *tendu patta*) are nationalized, which means the State has a monopoly on collection and trade; the government organizes competitive sale through public auction and the profit is distributed among the gatherers. Uttarakhand is experimenting with organized collection and open auction of some non-nationalized medicinal plants, offering 94 percent of the auction profit to the collectors' organization as royalties. In Orissa, village councils have the power to set the minimum procurement price for the 69 registered NWFPs. Stakeholders have expressed concern that government monopoly can be detrimental to local collectors and enterprises (FGLG-India, 2008).

Market information and documentation lack reliability because traders are not legally required to provide trade-related information to state forest departments and communities. The lack of a transparent and accessible information system hampers collectors in negotiating better prices (Karki and Rawat, 2004). A system of voluntary disclosure whereby traders and industry provide trade information (including source of raw material and purchase and sale price) to the state forest department has been suggested but may not be practicable under India's socio-economic conditions. Some recent interventions have been introduced to trace the product inflow in the market:

- The Chhattisgarh Medicinal Plant Bill calls for registration of all medicinal plant traders and makes it mandatory for them to submit the

CHHATTISGARH FOREST DEPARTMENT

Traditional collection, processing and storage practices have focused on ensuring the quality of medicinal plant products, but upgrading these skills can ensure that local people share in the commercial benefits (processing of Indian gooseberry fruits by local communities, Chhattisgarh)

details of any collected or traded medicinal plant or part thereof to the Chief Executive Officer.

- In Orissa, traders registered by village councils are liable to furnish information on monthly and annual returns from NWFPs.
- In Uttarakhand, registered traders at medicinal plant markets must provide a certificate of origin along with details of sales and income tax.

A number of governmental and non-governmental organizations in Chhattisgarh and Madhya Pradesh have developed activities to upgrade skills for conservation, sustainable management, processing and value addition.

EXISTING STANDARDS AND CERTIFICATION SCHEMES

In the past decade a number of organizations have endeavoured to develop standards and good practices for MAPs. The *WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants* published by the World Health Organization (WHO, 2003) has provided a model for adaptation in national and regional guidelines. Examples include guidelines developed by the Swiss Import Promotion Programme (SIPPO) for collection of wild plants marketed as "organic", covering details of collection, drying and processing of wild collected materials as well as purchase, processing and marketing aspects (Muller and Durbeck, 2005); and the European Medicines Agency (EMEA, 2006) guidelines on specific issues associated with agricultural production and collection of medicinal plants or herbal substances in the wild, which emphasize cultivation, good harvesting practices, quality assurance, primary processing, packaging and documentation practices. The Botanical Raw Material Committee of the American Herbal Products Association, in cooperation with the American Herbal Pharmacopoeia, has recently developed draft GACPs for collectors and growers of herbs to verify the identity of herbal raw material used in drugs and other products and to minimize adulteration (AHPA and AHP, 2006).

In 2004, an expert group convened by the Worldwide Fund for Nature (WWF), the wildlife trade monitoring network TRAFFIC and the International Union for the Conservation of Nature (IUCN) conceived a set of four draft standards on ecosystem and MAP resource management; collection from the wild; domestication, cultivation and enhanced *in situ* production; and rights. In 2005, a second draft condensed these four standards into a single standard with ten principles, related criteria and proposed indicators. The most recent version, which takes into account field evaluation, stakeholder and expert opinions and other relevant international guidelines and regulations, has six principles, 18 criteria and 105 indicators covering areas from environmental, social and management issues to economic and business development issues, which are proposed to be used for certification of collection of MAPs from the wild (Medicinal Plant Specialist Group, 2007).

There is no exclusive scheme for medicinal plant certification. The Forest Stewardship Council (FSC), although developed for timber certification, also includes medicinal plants and other NWFPs under its purview. Currently, FSC provides NWFP/MAP certification for individual species on a case-by-case basis as the variety and complexity of the management criteria are much higher than for timber (Brown, Robinson and Karman, 2002). The Programme for the Endorsement of Forest Certification schemes (PEFC) recently issued a technical document on chain of custody certification for NWFPs (Brunori, 2007).

Product quality standards such as good manufacturing practices, the International Organization for Standardization (ISO) 9000 series for management systems and the ISO 14000 series for environmental management also apply to medicinal plants. International and national standards for organic certification, such as those of the International Federation of Organic Agriculture

ICCF, IIFM

Field-level NWFP certification workshop, Madhya Pradesh

Movements and, in India, the National Programme for Organic Production, may be applicable for both cultivated and wild medicinal plants. To achieve socio-economic goals, fair trade certification can also play a major part (Jain, 2004). However, no existing scheme is comprehensive enough to cover wild medicinal plant collection, storage, quality and marketing along with environmental, social and economic considerations. These areas can be covered by combining different schemes, but doing so would be complex and perhaps not cost effective (Wenban-Smith *et al.*, 2006).

In India, attempts to certify MAPs have started recently. In 2001, WWF India initiated a study on three medicinal plants on forest land in Himachal Pradesh to evaluate the applicability of FSC principles (Rastogi and Pant, 2004). The state of Chhattisgarh formed the Chhattisgarh Certification Society, which covers a range of NWFPs but gives priority to richness of MAPs and their economic potential for the state (CG MFP Federation and Chhattisgarh Forest Department, 2003). A recent project sponsored by the National Medicinal Plant Board and the International Development Research Centre (IDRC) in one district of Chhattisgarh devised a set of generic standards covering good collection and other practices, as well as a set of species-specific standards for 10 species (Katiyar, 2007). Similarly, in Uttarakhand, Winrock International has begun work on MAP certification for five medicinal plant species (including lichen), with an aim to develop some species-specific standards (Winrock India, 2007). Given the present scenario MAP certification may seem ambitious for India, but good practices can be adopted step by step.

DRAFT CERTIFICATION STANDARD

The standard framework developed by the ICCF project has four tiers consisting of four principles and related criteria, indicators and verifiers. The criteria and indicators from the most recent draft are presented in the Table.

The standard was developed in several phases. First, through a series of meetings and consultations, interested policy-makers, professional foresters, academic institutions, NGOs, traders and industry representatives reviewed the different international certification frameworks, assessed their applicability and proposed adaptations. Second, the modified draft standard was tested in the field through a participatory process

Poster to raise community awareness of NWFP certification process

ICCF, IIFM

Criteria and indicators from draft MAP certification standard

Criteria	Indicators
Principle 1: Legal and policy framework	
1.1 Use/tenure rights are well established by appropriate government order and compliance in the field ensured	1.1.1 Collectors have a clear right to access, use and manage MAP resources traditionally in known forest areas
	1.1.2 a. Existence of traditional management practices or written documents such as micro plan, working plan, etc. b. Availability of the respective orders at local level
	1.1.3 Compliance of government orders
	1.1.4 Regulatory actions against violation
	1.1.5 Availability of microplans/other management plans having regulations on different aspects of sustainable management
1.2 Laws, regulations and administrative requirements for conservation and development are in place	1.2.1 National/state/community-level conservation laws and regulations
	1.2.2 Implementation at the field
	1.2.3 Periodic review mechanism
1.3 Registration of collectors, collection agents, intermediaries and traders are mandatory in the area	1.3.1 Provisions for registration by village councils, Joint Forest Management Committees, Panchayat, Biodiversity Management Committee
	1.3.2 Provision for periodic inspection of registration
	1.3.3 Availability of registration document with all necessary details (personal information, collection details, etc.) at the local level
1.4 Regulation of forest-based MAP transit (by transit pass or other means) is required	1.4.1 Appropriate legal instrument for regulation of harvesting period, quantity and transit of wild MAPs
	1.4.2 Availability of detailed information on MAPs to be transported
	1.4.3 Availability of special transit provision for prioritized plants
Principle 2: Wild area conservation and management	
2.1 Area management plan is prepared	2.1.1 Micro plan/working plan/management plan includes local wild MAP resources and their socio-economic importance
	2.1.2 Planning is done in a participatory manner
	2.1.3 Plan is in parity with other management plans of the adjacent or overlapping area(s), if existing
	2.1.4 Periodical review of the plan
	2.1.5 Local level availability (in local language) and compliance with the plan
2.2 Inventory, assessment and monitoring of MAP resources are planned for better management	2.2.1 Local-level inventory of MAP resources
	2.2.2. Conservation status assessment of socio-economically important MAPs
	2.2.3 Regular monitoring of MAP resources is carried out
2.3 Sensitive species and habitat conservation plan is prepared to identify synergies	2.3.1 Maximum conservation measures for species (i.e. *in situ, ex situ*) are taken into consideration
	2.3.2 Habitat/ecosystem conservation planning with due emphasis on livelihood issues exists
	2.3.3 Local participation in conservation activity is ensured
	2.3.4 Traditional practices related to conservation are encouraged
2.4 Conservation strategy and action plan is in place to maintain germplasm	2.4.1 Peoples Protected Areas, *ex situ* conservation, herbaria, seed material, etc.

(continues)

(continued)

Principle 3: Responsible collection and use practices	
3.1 Good collection practices are followed	3.1.1 Identification of species to be collected and regulated or discontinued a. Endangered or critically endangered species: no collection b. Vulnerable species: management strategies are defined and recommended for implementation c .Threatened species and other categories: regulated collection
	3.1.2 Detailed map of collection sites
	3.1.3 Collection area is free from possible contamination sites/sources (settlements/roads/ other)
	3.1.4 Collection instructions for each prioritized species (time, method, instruments) made based on available scientific information and traditional practices
	3.1.5 Allowable collection quantities are defined in consultation with stakeholders and as per the record available using reliable and practical measurement methods
	3.1.6 Wastage due to poor and destructive collection practices is minimized
	3.1.7 Local level availability of and compliance with the collection instructions
3.2 Collection intensity and species regeneration are studied thoroughly before the limit is set	3.2.1 Baseline information is prepared on population size distribution, structure (age classes) in the collection area, habitat details (topography, geology, soil, etc.)
	3.2.2 Age and size of plants for collection is defined (e.g. plant diameter, diameter at breast height, height, flowering and fruiting)
	3.2.3 Maximum allowed frequency of collection of prioritized species does not exceed the rate of replacement (regeneration)
3.3 Quality assessment of the collected material	3.3.1 Quality of collected material determined by nationally/internationally accepted standards
	3.3.2 Quality assessment done through accredited laboratories/organizations
	3.3.3 Information on availability of quality assessment and testing facilities at the local/ regional level
3.4 Storage, maintenance and traceability of collected raw material follow standard practices	3.4.1 Adequate storage facility created or exists in nearby dry area (warehouse is spacious, ventilated; pest free and clean; collected material is placed in an orderly manner)
	3.4.2 Collected materials are properly labelled with details (local and scientific name of the material, part collected, place and date of collection, collector's code, date and time of storage, sealing date, etc.)
	3.4.3 Storage register is maintained and updated regularly
Principle 4: Benefit sharing and livelihood security	
4.1 Processing and value addition of NWFPs/MAPs are strengthened and diversified to boost local economy	4.1.1 Skill upgrading at the local level
	4.1.2 Availability of storage and processing facilities
	4.1.3 Local availability of microfinance/microcredit
	4.1.4 Establishment of market linkage
4.2 Market facilitation for MAP resources is promoted through more diverse buyer-seller contact	4.2.1 Availability of authentic market information
	4.2.2 Market development and promotional activity
	4.2.3 Transparency in chain of custody
4.3 Price fixing and benefit sharing mechanisms are based on stakeholder interests as well as market demand	4.3.1 Minimum price of raw and processed material is fixed on the basis of demand-supply assessment
	4.3.2 Profits are distributed among the stakeholders on the basis of well-defined benefit sharing mechanisms
4.4 Worker safety and favourable working atmosphere are provided	4.4.1 Adequate safety and precautionary measures taken
	4.4.2 Necessary equipment and training provided for collection and processing
	4.4.3 Compliance with relevant laws/regulations

involving gatherers, field foresters, local traders, researchers and NGOs. Third, the framework was refined in regional workshops. It is now being implemented in the field in different parts of India including the four project states.

This standard would be used to certify both sustainable collection practices and the area where resources are being extracted sustainably. Certification would be carried out by independent agencies for greater market advantage, but internally communities (e.g. Joint Forest Management Committees and village governments) and local forest department units would have to show that they satisfy the requirements of sustainable management of MAP resources as part of working plan prescriptions.

The Ministry of Environment and Forests, the Government of India and the National Medicinal Plant Board have initiated a process for ensuring that certification can be implemented in the Indian context, while including options for further improvement and development. Wide stakeholder consultation and awareness raising on the positive and negative aspects of MAP certification are required before it can be implemented. The various stakeholders are expected to report on the applicability of the elements of the draft standard on the basis of available field data and on the information collection required to show compliance with the standard.

Most stakeholders have identified the costs of certification and the requirements for documentation as major constraints. The study therefore concluded that a certification system should emphasize field inspection and verification rather than requiring cumbersome documentation.

The authors would welcome constructive feedback.

CONCLUSION

MAP certification is a new and still emerging concept in India. Despite the rich tradition of MAP use, it is necessary to improve practices in line with well-defined environmental and social parameters as well as international norms. Drug manufacturers and exporters are the major consumers of wild raw materials; government initiatives are necessary to encourage them to use certified raw materials which may lead to a reputation for good resource management.

Considering the varied interests of multiple stakeholders, institutions that have been established to organize the MAP sector need to take a multidimensional approach to planning and management, competitive marketing strategies and flexible policies. Legal collection, resource management, raw material quality, market facilitation, traceability and transparency, should be the thrust areas for future research and development. Traditional practices have key importance in the setting and acceptance of standards. Certification is a participatory process and so is standard setting. Both primary collectors and end users have responsibilities in developing standards and complying with them.

The development of standards and their application for certification are quite different matters. Group or phased certification is recommended to help stakeholders eventually meet certification requirements and provide the detailed documentation needed. The gap between existing practices and the use of standard parameters may seem wide, but a phased adoption of good practices or "good steps" will help to narrow it. ◆

Bibliography

American Herbal Products Association (AHPA) & American Herbal Pharmacopoeia (AHP). 2006. *Good agricultural and collection practice for herbal raw materials.* Silver Spring, Maryland, USA, AHPA.

Bhattacharya, P. 2006. *Final report on science and technology application for enhancement of rural livelihoods: community based sustainable management and cultivation of satawar (*Asparagus racemosus*) in Chambal Ravine of Sheopur District of M.P.* Bhopal, India, Indian Institute of Forest Management (IIFM).

Bhattacharya, P. 2008. *Proceedings of National Workshop on Integrating Medicinal, Aromatic and Dye Plants in Forest Working Plan.* Bhopal, India, IIFM-ICCF.

Bhattacharya, P. & Hyat, S.F. 2004. Sustainable NTFP management for rural development: a case from Madhya Pradesh, India. *International Forestry Review*, 6(2): 161–168.

Brown, L., Robinson, D. & Karman, M. 2002. *The Forest Stewardship Council and non-timber forest product certification: a discussion paper.* Oaxaca, Mexico, Forest Stewardship Council.

Brunori, A. 2007. NWFP certification. *Non-Wood News*, 15: 22.

Chhattisgarh Forest Department. 2007. *Special projects: Peoples Protected Area (PPA).* Internet document, available at: cgforest.nic.in/ppa_new.htm

Chhattisgarh State Minor Forest Produce (Trading and Development) Co-operative Federation Ltd (CG MFP Federation) & Chhattisgarh Forest Department. 2003. *The Raipur Report – Chhattisgarh Forest Department led Non-Wood Forest Produce Certification Initiative.* Available at: cgforest.nic.in/nwfp_certification_1.htm

Durst, P.B., Mckenzie, P.J., Brown, C.L. & Appanah, S. 2006. Challenges facing certification and eco-labelling of forest products in developing countries. *International Forestry Review*, 8(2): 193–200.

European Medicines Agency (EMEA). 2006. *Guideline on good agricultural and collection practice for starting materials of herbal origin.* London, UK. Available at: www.emea.europa.eu/pdfs/human/hmpc/24681605en.pdf

Forest Governance Learning Group (FGLG) India. 2008. *Non timber forest products and forest governance: a synthesis*

report. Secunderabad, India, Centre for People's Forestry.

Indian Institute of Forest Management (IIFM). 2007. *Regional dialogue: development of medicinal plants policy brief for sustainable harvest, pricing and trade regime of wild produce within the framework of participatory forest management.* Unpublished meeting report. Bhopal, India.

International Centre for Community Forestry (ICCF). 2007. *Development of standards for sustainable collection and management of medicinal and aromatic plants from forest area of Chhattisgarh, Madhya Pradesh, Uttarakhand and Orissa – field survey report*. Bhopal, India. (unpublished)

Jain, P. 2004. *Certifying certification: can certification secure a sustainable future for medicinal plants, harvesters and consumers in India?* TRAFFIC Online Report Series No. 9. Cambridge, UK, TRAFFIC International. Available at: www.traffic.org/medicinal

Karki, M. & Rawat, R.B.S. 2004. Sustainable forest management – definitions, good practices and certification. In *Encyclopedia of Forest Sciences*, pp. 1357–1367. Amsterdam, the Netherlands, Elsevier.

Katiyar, A. 2007. *Group certification for organic NTFPs: Dhamtari approach.* New Delhi, India, International Development Research Centre (IDRC), International Centre for Integrated Mountain Development (ICIMOD), National Medicinal Plant Board & CG MFP Federation.

Lawrence, A. 2006. *Methodology for planning sustainable management of medicinal plants in India and Nepal.* Final Technical Report R8295. Oxford, UK, Environmental Change Institute, University of Oxford, UK.

***Madhya Pradesh Gazette*.** 2005. Madhya Pradesh Forest Produce Rules – Biodiversity (Flora & Fauna Conservation and their Sustainable Harvesting from Government Forest) F-25-135-2004 X-3 Indian Forest Act, 1927 Article 76 Para (4).

Medicinal Plant Specialist Group. 2007. *International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP), Version 1.0.* Bonn, Germany, Federal Agency for Nature Conservation & WWF-Germany.

Misra, M.K. & Jain, P. 2003. *Base line information on medicinal plants conservation and sustainable utilisation – Uttaranchal.* Bangalore, India, Foundation for Revitalisation of Local Health Traditions. Available at: www.frlht.org.in/html/reports/uttaranchal.pdf

Muller, S. & Durbeck, K. 2005. *Guidance manual for organic collection of wild plants*. Zürich, Switzerland, Swiss Import Promotion Programme (SIPPO). Available at: www.sippo.ch/files/publications/agri_wildplants05.pdf

Ojha, N. 2004. Schedule V areas: rights over MFP still a far cry. *Community Forestry*, 3(3): 4–7.

***Orissa Gazette*.** 2002, Extraordinary Gazette published by authority No 2091, Cuttack, 200215, 2002/Katrika 24, 1924, Panchayati Raj (G.P.) Department.

Pierce, A.R. & Laird, S.A. 2003. In search of comprehensive standards for non-timber forest products in the botanicals trade. *International Forestry Review*, 5(2): 138–147.

Pierce, A., Shanley, P. & Laird, S. 2003. Certification of non-timber forest products: limitations and implications of a market based conservation tool. Paper presented at the International Conference on Rural Livelihoods, Forests and Biodiversity, Bonn, Germany, 19–23 May.

Planning Commission, Government of India. 2006. *Report of the Task Force on the Mountain Ecosystems (Environment and Forest Sector) for the eleventh Five Year Plan*. New Delhi, India.

Prasad, R. & Bhattacharya, P. 2003. Sustainable harvesting of medicinal plant resources. *In* S.B. Roy, ed. *Contemporary studies in natural resource management in India*, pp. 168–198. New Delhi, India, Inter-India Publications.

Prasad, R., Kotwal, P.C. & Mishra, M. 2002. Impact of harvesting *Emblica officinalis* (Aonla) on its natural regeneration central Indian forests. *Journal of Sustainable Forestry*, 14(4): 1–12.

Rastogi, A. & Pant, R. 2004. *FSC certification feasibility assessment report, Himachal Pradesh, India*. Technical Report. New Delhi, India, WWF India.

Sahu, A.K. 2002. Neighbouring states, differing policies. *Community Forestry*, 2(2): 4–11.

Schippmann, U., Leaman, D. & Cunningham, A.B. 2006. A comparison of cultivation and wild collection of medicinal and aromatic plants under sustainability aspects. *In* R.J. Bogers, L.E. Craker & D. Lange, eds. *Medicinal and aromatic plants: agricultural, commercial, ecological, legal, pharmacological and social aspects*, pp. 75–95. Wageningen UR Frontis Series, Vol. 17. Dordrecht, the Netherlands, Springer.

Sindhi, S. & Choudhury, P.R. 2003. NTFP certification: possibilities galore. *Community Forestry*, 3(1): 24–28.

Ved, D.K., Kinhal, G.A., Ravikumar, K., Karnat, M.R., Vijaya Sankar & Indresha, J.H., eds. 2003. *Workshop Report on Threat Assessment and Management Prioritization for the Medicinal Plants of Chhattisgarh and Madhya Pradesh*, Bhopal, India, 23–26 July 2003. Bangalore, India, Foundation for Revitalisation of Local Health Traditions.

Verma, S.K. 1998. Evolving mechanism for NTFP oriented forest management. *Forest Usufructus*, 1(1&2): 1–22.

Wenban-Smith, M., Bowyer, J., Fernholz, K. & Howe, J. 2006. *Combining organic and FSC certification of non-timber forest products: reducing costs, increasing options*. Minneapolis, Minnesota, USA, Dovetail Partners, Inc.

Winrock India. 2007. *Active projects, natural resources management: Developing Standards for Certification of Medicinal and Aromatic Plants in Uttarakhand*. Internet document, available at: www.winrockindia.org/aromatic_plants-%20in_uttarakhand.htm

World Health Organization (WHO). 2003. *WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants.* Geneva, Switzerland. ◆

Corporate social responsibility in forestry

R. Panwar and E. Hansen

Corporate social responsibility practices should address sustainability issues important to local stakeholders – issues that are best identified locally.

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Over time, society's expectations of businesses as responsible social institutions have increased and evolved. The idea that business has some social responsibility is not new, but corporate social responsibility (CSR) has drawn increased attention in the past decade, partially as a result of corporate scandals arising from a misalignment between industry's judgment regarding its responsibilities and the concomitant judgment of society. Another factor explaining increased attention to CSR is the advent of globalization, a phenomenon that connects global corporations with local communities across the globe, with notable social implications.

Societies conceptualize CSR differently depending on the socio-economic context. At one extreme are societies – usually with a high level of economic development and strong democratic traditions – that expect business to be a vehicle for sustainable development. At the other extreme are societies – usually less economically developed – that expect business to be a purely economic activity that provides jobs and fulfils other economic functions. Societal expectations of business responsibilities broaden as a society passes through the phases of economic development and as its population increasingly seeks to meet not only physical but also social and personal-growth needs.

The regulatory framework surrounding business organizations and society's expectations of business are tied together, but in different ways. In some countries, regulations shape societal perceptions, while in others societal expectations influence the regulatory framework. The legal requirements that business must meet can also differ a great deal from one society to another. Such differences in legal requirements may lead multinational companies to move their operations to locations with less stringent environmental and social regulations – a phenomenon known as "industrial flight" or "race to the bottom".

There is no single commonly accepted definition of CSR. The World Business Council for Sustainable Development (2000) integrated aspects of the concept of sustainable development in its definition, "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large". Since the post-Rio world has increasingly been converging around a sustainable development mandate, this definition has gained increasing recognition. Corporate definitions of CSR reflect a similar approach. For example, Stora Enso (2008), one of the leading forest products companies, maintains that its CSR principles "cover issues including human rights, labour rights, ethical business practices, communications and community involvement".

In an economically globalized world,

D. STALLCOP

Because of the costs involved, smaller companies in developing countries may pay less attention to CSR concerns such as worker safety (furniture production, New Delhi, India)

corporations are subject to global expectations, and a globally accepted and broad concept like sustainable development fits well with the economic, social and environmental responsibilities of global corporations. Accordingly, the triple bottom line approach to CSR (Elkington, 1997) suggests that a business organization must strive to balance these three areas of responsibility. Because of its alignment with the concept of sustainable development, this approach is widely applied around the world. Associating CSR with sustainable development has become so common that CSR reporting is often called sustainability reporting.

This article suggests an issues management methodology that can help companies in the wood products sector better manage their CSR focus.

CSR IN THE WOOD PRODUCTS SECTOR

Societal expectations of business differ not only by country and culture but also from one industry to another. Accordingly, the Global Reporting Initiative (GRI; see www.globalreporting.org) includes sector supplements addressing the unique needs of specific sectors as part of its Reporting Framework. However, there is no such supplement for the forestry sector.

The wood products sector operates under more intense public scrutiny than other extraction-based industries (Bhambri and Sonnenfield, 1988; Nasi, Nasi and Zyglidopoulos, 1997) because wood comes from forests and forests are commonly seen by the public as natural places that should be relatively untouched by humans. Forest certification and eco-labelling are two important concepts to ensure that wood is sourced from sustainably managed forests. But CSR can go further.

Of the 100 largest forest products companies in the world, 61 are reported to have produced sustainability reports (PricewaterhouseCoopers, 2007), and the proportion is increasing. However, most of the social (health and safety) and environmental (air emissions) indicators that these companies use in their sustainability reports are already part of legislative requirements. As such, these reports do not show the companies to be making any extralegal commitments to help society and the environment.

In addition, most of the companies that publish sustainability reports are headquartered in developed countries. In developing countries much attention has focused on the social and environmental aspects of forestry practices, but less information is readily available regarding the social and environmental performance of forest products manufacturers.

Additionally, there is more literature pertaining to CSR practices of large companies than of small ones. In India, for example, some large paper companies, such as Ballarpur Industries and Star Papers, place emphasis on their social responsibility, yet the state of CSR is largely unexamined in the thousands of small sawmilling facilities. Because of the costs, larger companies may engage in CSR practices more often than smaller ones, which may for example give less attention to applying safety measures and complying with existing environmental regulations.

It may be argued that different societies will take different routes to achieving sustainability (Kennedy, 2007). In the same vein, CSR programmes and standards should be defined locally. Well-intended programmes may be perceived as company rhetoric if the local context is not given adequate consideration. Illustrating the different CSR needs of different societies, Panwar and Hansen (2007) presented separate sets of economic, social and environmental issues that stakeholders in the United States and India think forest products manufacturers in their countries should address.

Because societal expectations and the regulatory framework governing business are linked as described above, in countries that have higher standards of regulations (as well as compliance) some issues may not be seen as part of a CSR portfolio. For example, worker safety and working conditions are not considered important issues for United States forest products companies from a CSR perspective, whereas they might be important in other societies that have either weak regulations governing workers' conditions or ineffective compliance with regulations that are in place. Child labour may be an issue in developing countries; while legislation aims to abolish it, a socially responsible company might go further, for example by giving children opportunities for skills development training or formal education.

A WAY FORWARD: ISSUES MANAGEMENT FOR FOREST PRODUCTS COMPANIES

A company interested in embracing CSR is confronted with a choice of approaches and methods, for example stakeholder management (focusing on those groups that are affected by or can affect a company's decisions), corporate social performance (focusing on outcome) and issues management (focusing on problems rather than groups).

In issues management, identification of issues is the first step. This can be done by interviewing key stakeholders to identify issues that they consider important and worthy of managerial attention. To improve on this method, Panwar (2008) proposed a second stage, a Delphi process – i.e. a process in which a group of neutral and informed participants answer questions and give controlled feedback in an iterative process until agreement is reached – to refine the list of issues generated via interviews. A concise list will help those companies that desire to start implementing CSR in small steps. A longer list is useful for companies that have already taken some initiatives to adopt CSR and are ready to further invest.

A research project at Oregon State University in the United States recently used this approach to develop a set of issues that United States forest product companies must address in order to be socially responsible. Panwar (2008) conducted 13 interviews with key stakeholders including representatives from non-governmental organizations interested in the forest sector, government officers in the federal Forest Service, political office holders, representatives of industry associations and university extension officers that routinely interact with industry. In all, 12 social and 20 environmental issues were identified for attention. In order to make this list concise, a two-round Delphi process was conducted with faculty members dealing with forest products business from different United States universities. After the second round, consensus was reached among participants regarding six social and six environmental issues that should be addressed by socially responsible forest products industries in the United States (see Box).

With modifications, this approach could be used in other countries. The issues management process can help companies develop CSR programmes that are time and context relevant, while simultaneously ensuring their legitimacy as they are based on societal expectations rather than on negotiation among powerful stakeholders, as is typically the case in the more prevalent stakeholder management approach.

FUTURE OF CSR IN FORESTRY

Societies interact with nature in different ways, and commercialization of forest resources has already had a tremendous impact on the way many forest-based communities interact with nature. Thus it is important that CSR practices be based on input from local stakeholders rather than importing regulations from outside. Experts in forestry, business, sociology and anthropology can help develop CSR programmes suited for local contexts. This is especially important for nature-based sectors such as forestry and forest products since

Issues for socially responsible forest products industry in the United States, identified through an issues management process

SOCIAL ISSUES

- **Encourage public scrutiny of environmental and land management practices**
- **Invest in surrounding communities**
- **Promote responsible consumption among consumers**
- **Stem declining employment in the sector**
- **Engage with surrounding communities**
- **Improve industry's public image**

ENVIRONMENTAL ISSUES

- **Promote sustainable forestry practices**
- **Increase the use of renewable resources**
- **Adopt environmentally sound purchasing policies**
- **Mitigate global warming**
- **Reduce overall energy consumption**
- **Improve waste management**

they are pivotal to livelihoods in many societies. CSR standards must avoid a "one size fits all" approach. To this end, the authors advocate the development of a supplement for forest products in the GRI Reporting Framework, as well as a way to include country-specific considerations.

CSR, in combination with sustainable forest management, has potential to enable companies to foster a better state of the world's forests and societies. But imported concepts and standards can turn into rhetoric whose only purpose is to strengthen a company's image in society, undermining the promise that CSR holds for securing sustainability. A locally focused approach can help CSR become a legitimate tool for helping business define its role in society. ◆

Bibliography

Bhambri, A. & Sonnenfield, J. 1988. Organization structure and corporate social performance: a field study in two contrasting industries. *Academy of Management Journal*, 31 (3): 642–662.

Elkington, J. 1997. *Cannibals with forks: the triple bottom line of 21st century business.* Oxford, UK, Capstone.

Kennedy, D. 2007. Sustainability. *Science*, 315(5812): 573.

Nasi, J., Nasi, S. & Zyglidopoulos, S. 1997. The evolution of corporate social responsiveness: an exploratory study of Finnish and Canadian forestry companies. *Business and Society,* 36(3): 296–321.

Panwar, R. 2008. Corporate social responsibility in the forest products industry: an issues management approach. PhD dissertation, Oregon State University. Available at: ir.library.oregonstate.edu/dspace/bitstream/1957/8940/1/CSR-Forestindustries.pdf

Panwar, R. & Hansen, E. 2007. The standardization puzzle: an issue management approach to understand corporate responsibility standards for the forest products industry. *Forest Products Journal*, 57(12): 86–91.

PricewaterhouseCoopers. 2007. *Growth: global forest, paper & packaging industry survey.* 2007 edition: Survey of 2006 results. Available at: www.pwc.com/fppsurvey07

Stora Enso. 2008. *Sustainability glossary.* Available at: www.storaenso.com/links/glossary/sustainability-glossary/Pages/sustainability-glossary.aspx

World Business Council for Sustainable Development. 2000. *Corporate social responsibility – meeting changing expectations.* Geneva, Switzerland. Available at: www.wbcsd.org/DocRoot/hbdf19Txhmk3kDxBQDWW/CSRmeeting.pdf ◆

Corporate social responsibility for successful business: an example from Latin America

P. Hurtado

ARAUCO

Programmes of the Arauco Education Foundation include a mobile library to encourage children to read

Although there is no universally recognized definition of corporate social responsibility (CSR), the concept reflects a view of business that encompasses respect for ethical values, persons, communities and the environment. CSR is a combination of policies, practices and programmes that are incorporated into business operations, support the decision-making process and are rewarded by the leadership.

In the past ten years, many businesses have recognized, with support from empirical studies, that incorporating socially responsible practices and policies has positive effects on returns. Pressure from consumers, suppliers, communities, investors, activist organizations and others has also prompted companies and corporations to adopt or expand CSR efforts. Forest enterprises in Latin America are sensitive to this reality. The practices of the Chilean company Arauco illustrate how the concept of CSR can become part of corporate philosophy.

Arauco is one of the foremost forest enterprises in Latin America in terms of the area and yield of its plantations and its production of kraft cellulose (3 million tonnes per year), sawnwood (3.6 million cubic metres per year) and panels (2.6 million cubic metres per year). It markets its products in more than 60 countries and provides employment to more than 35 000 people in Argentina, Brazil, Chile and Uruguay.

The company's competitiveness is based on its forest assets, 1.48 million hectares of forest land in the four countries where it operates: 932 000 ha of pine and eucalyptus plantations, 302 000 ha of natural forest and 244 000 ha allocated for other uses. More than 20 percent of its landholdings are thus natural forest, which Arauco strictly protects and conserves in cooperation with local communities, environmental organizations and government departments responsible for the sector. Certain parts of the holdings are administered as private parks open to the public, areas of high environmental value and protected zones dedicated to biodiversity conservation.

As part of Arauco's commitment to sustainable development, the company's corporate policy involves transparent long-term relations with local inhabitants, self-sufficiency in electricity produced from forest biomass, the conservation of areas of high environmental value, support for public education and adoption of the best technology available worldwide.

With regard to relations with the local community, the inhabitants of more than 100 municipalities and departments are part of the Arauco community. The company helps to promote local development by generating employment; boosting trade, production, consumption and local entrepreneurship; improving infrastructure; and fostering recreation and social development in the local community. The company helps to improve the quality of public education through the Arauco Education Foundation, which by 2007 had supported 4 000 teachers and more than 70 000 pupils in 20 towns and 470 schools. And as part of efforts to mitigate climate change, Arauco issued and sold 482 129 carbon reduction certificates in 2007, each corresponding to 1 tonne of CO_2 per year.

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Asia-Pacific Forestry Week: Forestry in a changing world

The first Asia-Pacific Forestry Week, organized in Hanoi, Viet Nam from 21 to 26 April 2008, was the region's largest forest-related event of the year. An expanded setting for the twenty-second session of the Asia-Pacific Forestry Commission (APFC), the week was organized with local, regional and international partner institutions for wider participation. It was open to governments, multilateral institutions and the public and attracted more than 600 participants. The meeting identified and addressed the imminent challenges of protecting and managing the region's forest resources in a rapidly changing global environment. It was hosted jointly by the Vietnamese Government and FAO.

Plenary sessions focused on the three pillars of sustainable development: social, environmental and economic. The first, organized by the Regional Community Forestry Training Center for Asia-Pacific, explored challenges and opportunities for poor forest-dependent people. "Environment day", prepared jointly by FAO and the Center for International Forestry Research (CIFOR), focused on climate change and forests. It considered forest's role in climate change adaptation and mitigation, institutional arrangements and international agreements.

The session on economic aspects addressed trade, forest law compliance and governance, highlighting the changing role of forestry agencies. This session was led by the Asia Forest Partnership, with support provided by the Nature Conservancy and East Asia Forest Law Enforcement and Governance (Asia FLEG).

Special activites during the forest week included an essay contest for young professionals, a photo contest and an "information market" presenting forestry-related organizations, projects and activities in the region and allowing organizations to showcase their work through posters and displays. A daily newsletter introduced key participants, highlighted major events and shared ideas generated during the conference.

APFC is one of six FAO Regional Forestry Commissions. It offers a forum for member countries to share experiences in dealing with forestry challenges, advise FAO on regional forestry priorities and initiate joint action on key forestry issues. With 33 member countries, it is the region's most inclusive intergovernmental body dealing with forestry.

Joint meeting of regional commissions for Africa and the Near East

In 2008, for the first time, the Near East Forestry Commission (NEFC) and the African Forestry and Wildlife Commission (AFWC) held their biennial sessions jointly. Around 160 participants including ministers, heads of national forestry and wildlife agencies and representatives from non-governmental organizations and the private sector from over 50 countries met in Khartoum, the Sudan from 18 to 21 February to discuss urgent forest issues related to climate change, bioenergy, water resources and wildfires.

Asia-Pacific photo contest winner: "My forest, my home" by Eko Bambang Subiyantoro, Indonesia

Several African and some Near East countries have high but unrealized potential to benefit financially from climate change mitigation activities. The commissions recommended increasing sharing of experiences from the Clean Development Mechanism (CDM) in the region and engagement of the private sector in climate change mitigation projects in forestry. They noted the importance of addressing adaptation and mitigation opportunities in a holistic way, recommending that countries incorporate them into national forest programmes and link them with human development needs.

In the Near East, fossil fuels comprise the main energy source. In Africa, more than 80 percent of wood is used for energy, primarily for cooking and heating. The strategic role of forests in setting the energy agendas for the two regions was addressed during the course of the week. The commissions urged member countries to evaluate with care the costs and benefits of investing in bioenergy, as such investments may compete with food production and increase deforestation.

Clean water is increasingly scarce in many parts of both regions. The commissions recognized the important linkages between forests and water resources and the urgent need to use these to address many of the problems in both the forestry and water sectors. Relevant initiatives were recognized, such as the Green Wall of the Sahara and the Global Environment Facility (GEF) supported integrated natural resources management project in the Fouta Djallon Highlands, the great "'water tower" of West Africa.

Africa and the Near East are fire-prone regions, where human causes of fire are amplified by climatic conditions. Africa accounts for about half of the area burned by wildfires throughout the world, and as global temperatures rise, the need to manage wildfires increases. Many countries in the regions lack adequate capacity and policy measures to manage fire effectively through monitoring, early warning, preparedness, prevention and restoration. Recommendations focused on training of local communities in fire management, intersectoral approaches and enhanced regional cooperation.

AFWC reviewed the role of wildlife and protected areas in the sustainable development of Africa. Issues addressed included human-wildlife conflict, the role of wildlife resources in food security and poverty alleviation, multilateral environmental agreements, partnerships and communication and information exchange.

The Near East Forestry Commission reviewed progress in ongoing efforts to develop Guidelines for Good Forestry Practices in Arid and Semi-arid Zones, expected to be an important policy tool in the region.

Special events included a tree planting ceremony and a study tour.

Launch of the Global Forest Resources Assessment 2010

The Global Forest Resources Assessment 2010 (FRA 2010) was launched during a technical meeting of the FRA national correspondents held from 3 to 7 March at FAO headquarters in Rome. FRA 2010 will be the most comprehensive global forest resource assessment ever undertaken, with several new initiatives including a remote sensing survey in which new and archival satellite data will be used to produce global and regional tree-cover maps and improved estimates of forest area and forest area change.

Some 265 forest assessment specialists attended the technical meeting, including representatives from 154 countries and 14 key forest-related organizations. The meeting presented the specifications for the FRA process, which will consist of country reporting, special studies and the remote sensing survey. National correspondents thoroughly reviewed the FRA 2010 reporting tables, discussed technical issues and provided feedback to the FRA secretariat on the support needed to meet the FRA 2010 national reporting requirements. The gathering helped strengthen the national correspondent network as a dynamic meeting point for specialists in monitoring, assessment and reporting on forest resources.

Ten proposed special studies were presented at the meeting, and a Remote Sensing Task Force was convened with representation from about 20 major forest countries.

The linkages between FRA and other international reporting processes were underlined through statements and presentations by the International Tropical Timber Organization (ITTO), the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Forum on Forests (UNFF), the United Nations Economic Commission for Europe (UNECE) and the International Union for the Conservation of Nature (IUCN) and Jena University, Germany.

Regional follow-up meetings with countries will take place over the subsequent 12 months to build capacity and review country data.

XIII World Forestry Congress: update

The XIII World Forestry Congress, to be held from 18 to 25 October 2009 in Buenos Aires, Argentina, was officially presented at a high-level ceremony held in Buenos Aires on 8 October 2008. The launching event was organized both to draw attention to the congress at the national level and to call for the cooperation of the international community in providing financial support for countries that need it.

The World Forestry Congress is the most important forestry meeting worldwide. The 2009 congress will have the theme "Forests in development – a vital balance". It will offer representatives of the public and private sectors, the scientific community, foresters, professionals and other interested parties an opportunity to address sustainable forest management from a global and integrated perspective.

The deadline for submission of voluntary papers, originally set for June 2008, has been extended to 31 December 2008. Papers must not exceed 3 000 words and must include an abstract of not longer than 300 words. Three to five keywords should be chosen to identify the paper's placement within one of the congress's seven thematic areas (Forests and biodiversity; Producing for development; Forests in the service of people; Caring for our forests; Forest sector: development opportunities; Organizing forest development; People and forest in harmony).

Partners are welcomed to organize side events. The deadline for proposals for side events is 30 November 2008. These events will offer participants a unique opportunity for wider discussion and reflection, dissemination of messages, networking and personal contact. Side events will be scheduled for a maximum of two hours. Only one application per organizer will be considered.

For complete guidelines on submission of papers and details about the organization of side events (including costs and optional

services), please see the congress Web site (www.wfc2009.org) or request information by e-mail, mail or fax to:

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Urban forestry experts gather to promote sustainable urban development

The International Meeting on Urban Forestry "Trees Connecting People: In Action Together", co-organized by FAO and Promoción del Desarollo Sostenible (IPES), Peru, brought together experts and institutions from the whole world to build alliances to support the optimized role of trees and forests for livable cities. Held in Bogotá, Colombia from 29 July to 1 August 2008, the meeting shared experiences related to best practices, decision-making processes, lessons learned and opportunities for action, with specific attention to developing countries and countries in transition. The discussions will also assist FAO in establishing priority actions for its work programme on urban and peri-urban forestry.

Participants represented government institutions, local authorities and municipalities from all regions, non-governmental organizations, universities and research centres, the private sector and bilateral agencies. International institutions participating included the French Agricultural Research Centre for International Development (CIRAD); the Danish Centre for Forest, Landscape and Planning (KLV); the European Urban Forestry Research and Information Centre (EUFORIC); the Forest Survey of India (FSI); the International Development Research Centre (IDRC), Canada; Resource Centres on Urban Agriculture and Food Security (RUAF); UN-Habitat; and United Cities and Local Governments (UCLG).

Major themes discussed included synergy between agriculture, forestry and greening in urban and peri-urban areas; wood energy; tree and forest inventory; watershed management and payments for environmental services; carbon sequestration for climate change mitigation, and adaptation to climate change; and guidelines for municipal policy, participatory decision-making and urban forestry. The meeting also presented strategies for elevating the profile of trees and forests within national, regional and global urban agendas.

The conference identified priority areas to address in order to optimize benefits from sustainable management of urban trees and forests: strategic processes and tools, innovative research, knowledge transfer and information flow, people's involvement and empowerment, and a design, planning and management continuum.

In addition to international issues, the agenda included a special focus on issues of the host region, with case studies presented from Argentina, Brazil, Colombia, Cuba, Mexico, Panama, Peru and Uruguay. The meeting pointed out small-grant funding opportunities existing for those countries that have entered into partnership with the National Forest Programme Facility, which could provide support for policy development, planning, participatory processes, knowledge exchange and capacity building.

The Forest Research Institute of Malaysia (FRIM), with the support of FAO, will co-host a second international meeting on urban and peri-urban forestry in 2009 in parallel with the next National Malaysian Conference on Urban Forestry.

UN agencies unite with Norway to combat climate change from deforestation

The forest sector (mostly deforestation and forest degradation) accounts for around 17 percent of global greenhouse gas emissions – the second largest source after the energy sector. By 2100 clearing of tropical forests could release 87 to 130 gigatonnes of carbon to the atmosphere.

The Bali Action Plan, agreed at the thirteenth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Bali, Indonesia in 2007, gave Parties a mandate to negotiate a post-2012 instrument that would include possible financial incentives for forest-based climate change mitigation actions in developing countries. The Bali meeting also adopted a decision on "Reducing emissions from deforestation in developing countries", encouraging parties to explore a range of actions in this field.

On 24 September 2008, UN Secretary-General Ban Ki-moon and Norwegian Prime Jens Stoltenberg unveiled the new UN Reduced Emissions from Deforestation and Forest Degradation (UN-REDD) Programme, which will provide support to countries as part of an international move to include REDD in post-2012 climate change arrangements. The programme will be jointly carried out by FAO, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) in the spirit of the UN "delivering as one". The Government of Norway will finance the initial phase in the amount of US$35 million.

Nine countries have already expressed formal interest in receiving assistance through the UN-REDD Programme. Four of these, the Democratic Republic of the Congo, Indonesia, Papua New Guinea and the United Republic of Tanzania, will "quick start" their efforts by developing national strategies, establishing robust systems for monitoring, assessment, reporting and verification of forest cover and carbon stocks, and building necessary capabilities. The other five countries are Bolivia, Panama, Paraguay, Viet Nam and Zambia.

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In subsequent phases, pilot projects will be rolled out to test ways of managing existing forests to maintain their ecosystem services and maximize their carbon stocks while delivering community and livelihood benefits. The programme will also look at how payments could be structured under a climate convention instrument and the various financial and insurance options needed to cover forest losses from events such as fire and pest attack. International standards for measuring, reporting and verifying emissions from deforestation and degradation will also need to be developed.

The UN-REDD initiative is an immediate-action programme intended to demonstrate that early results are possible in some of the major forests of the world. It is aimed at tipping the economic balance in favour of sustainable management of forests so that their formidable economic, environmental and social goods and services can benefit countries, communities and forest users while also contributing to important reductions in greenhouse gas emissions.

CBD meetings focus on forest biological diversity

A review of the programme of work on forest biodiversity was one of the main agenda items at the thirteenth meeting of the Convention on Biological Diversity (CBD) Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), held at FAO headquarters in Rome from 18 to 22 February 2008. The Rome meeting also focused on the implementation of the programme of work on agricultural biodiversity, the impacts of climate change on biodiversity (options for mutually supportive actions addressing climate change within the three Rio conventions) and invasive alien species.

FAO and other partners organized numerous side events related to forest biodiversity, covering a range of topics such as meeting the growing demand for forest products and services while conserving biodiversity; assessing and monitoring biodiversity through national forest resources assessments to enable wise decision-making; and status and trends in conservation of forest genetic resources. A poster session addressed the theme "Mainstreaming biodiversity issues into forestry and agriculture".

SBSTTA drafted a long list of recommendations which were considered at the ninth Conference of the Parties in Bonn, Germany (19 to 30 May 2008). Among those incorporated in Decision IX/5 on forest biodiversity in Bonn were recommendations related to strengthening:

- forest biodiversity monitoring, inventorying and reporting;
- national and regional forest protected area networks and ecological connectivity;
- multidisciplinary scientific research on impacts of climate change and environmental degradation on forest biodiversity and eco-

system resilience, in particular for vulnerable forest ecosystems such as low-lying forests in coastal areas (including small island States), arid and semi-arid regions and high mountain forests in least developed countries;
- understanding of the potential of forest genetic diversity to address climate change, maintain forest ecosystem resilience and provide new sources of wood and non-wood forest products;
- forest governance for the conservation and sustainable use of forest biodiversity.

The decision on forest biodiversity taken at Bonn urged Parties to "address as a matter of priority major human-induced threats to forest biodiversity, including unregulated and unsustainable use of forest products and resources (including unsustainable hunting and trade of bushmeat, and their impacts on non-target species), climate change, desertification and desert creep, illegal land conversion, habitat fragmentation, environmental degradation, forest fires, and invasive alien species".

Decision IX/5 also embraced SBSTTA recommendations on ensuring that possible actions for reducing emissions from deforestation and forest degradation in developing countries provide benefits for forest biodiversity; ensuring that programmes and measures taken for the conservation and sustainable use of forest biodiversity support efforts to eradicate poverty and improve livelihoods; addressing direct and indirect negative impacts that biomass production and consumption for energy might have on forest biodiversity; taking a precautionary approach to genetically modified trees; and building knowledge on forest ecosystem services and tools for securing them, such as payments for ecosystem services.

MCPFE secretariat moves to Norway

Norway has assumed the chair of the Ministerial Conference on the Protection of Forests in Europe (MCPFE). Following the fifth ministerial conference, held in Warsaw, Poland in November 2007, the secretariat moved from Poland to Norway. Norway will retain the chair until after the next ministerial conference, probably within four to five years.

MCPFE is a policy process for intergovernmental cooperation towards sustainable management of forests in Europe. At ministerial conferences the ministers responsible for forests in Europe take decisions on common aspects of the highest political relevance regarding forests and forestry. The first conference was held in Strasbourg, France in 1990. Subsequent chairs have been Finland, Portugal, Austria and Poland.

The MCPFE Liaison Unit, now located in Oslo, is the coordinating secretariat of MCPFE. It is a service-oriented office to support the cooperation of the ministers responsible for forests in Europe. An Expert Level Meeting was held 7 to 8 May 2008 in Oslo with a focus on the work programme for implementation of the commitments of the Warsaw Conference. The work programme has the following programme elements:
- Sustainable forest management and climate change;
- Wood mobilization and sound use of wood;
- Multiple forest ecosystem services, including forests and water;
- Regional–global cooperation and partnership;
- Cross-cutting activities.

The expert meeting was attended by 88 delegates representing 31 European countries and the European Commission and 20 observer countries and organizations.

IUFRO workshops on science–policy interface

In many countries, the recent shift in research priorities from biophysical to environmental and social research, with a focus on poverty reduction, livelihoods and climate change issues, has been accompanied by attempts to improve interaction between the science community and relevant policy-makers and stakeholders. However, researchers continue to have difficulty reaching policy-makers effectively, especially in developing countries, because of constraints related to governance structures, timing of information, communication skills and resources for professional staff of science institutions such as science communicators and policy specialists.

For several years, the International Union of Forest Research Organizations (IUFRO) Special Programme for Developing Countries (SPDC) has been organizing regular training workshops on the science–policy interface for forest scientists from developing countries. In 2007, for example, three such events entitled "Working effectively at the interface of forest science and forest policy" were held in Malaysia, Ecuador and Kenya. From 31 March to 1 April 2008, such a workshop was held specific to mountain forestry development, in conjunction with the International Conference "Mountain Forests in a Changing World" in Vienna, Austria (see below).

The overall objective of these workshops is to help researchers plan, conduct and organize research activities so that results can more quickly and easily be transformed into usable information for problem-solving and policy-making. To this end, they aim to improve the understanding of policy- and decision-making processes and the roles scientists can play in informing such processes.

The workshops elaborate on best practices for science-policy interactions published by IUFRO in 2005 (see www.iufro.org/publications/series/occasional-papers [No. 17]), exploring their adaptation to various backgrounds and contexts such as international policy processes, national forest programmes and pro-poor policies at the local level.

Owing to keen interest from the forest science community in developing countries, additional workshops will be offered in the future.

International conference on mountain forests informs special masters programme

The effects of climate change, wars, migration and overexploitation of natural resources and changes of land-use patterns are particularly severe in mountain regions. Today the sustainable production of wood in mountain forests needs to be balanced with society's demands for clean drinking-water, biodiversity, tourism and livelihoods. Air pollution and climate change present additional challenges. Increased demand for biomass for energy may increase the potential for land-use conflicts, and the consequences may be severe for people living in mountainous areas, which are home to a disproportionate number of the world's poorest people.

The International Conference "Mountain Forests in a Changing World", held in Vienna, Austria from 2 to 4 April 2008 by the University of Natural Resources and Applied Life Sciences (Universität für Bodenkultur Wien [BOKU]) explored mountain forest research in the broad context of sustainable management of mountain areas. Main themes included:

- conservation and environmental services;
- production and the role of mountain forests for people's livelihoods;
- mountain forests under pressure – risks and hazards;
- education and capacity building.

For the past five years BOKU has offered a unique International Masters Programme in Mountain Forestry – defined as the sustainable, science-based management of forests and woodlands in mountain areas, taking specific ecological, ethical, technical, social, economical and political conditions of complex mountain systems into consideration.

The conference was intended not only to present the latest advances in mountain forest research, but also to highlight the role of academic education for sustainable resource management and to stimulate new ideas that could be integrated in the university's curricula. The conference was also conceived to stimulate collaborative action on mountain forest research and education in the context of the Mountain Partnership – a voluntary alliance of partners (48 countries, 16 intergovernmental organizations and 89 civil society, non-governmental and private-sector groups) dedicated to improving the lives of mountain people and protecting mountain environments around the world, whose central secretariat is hosted by FAO.

For more information on the masters programme at BOKU, see: www.boku.ac.at/mf.html

DVD on forests and climate change

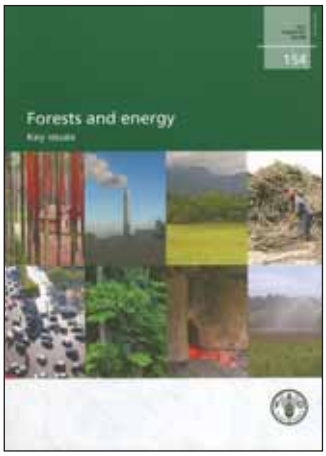
Forests and climate change: a convenient truth. 2008. Rome, Forestry Commission, UK & FAO. ISBN 978-92-5-006019-4.

Rainfall patterns are changing, sea levels are rising, glaciers are retreating and Arctic Sea ice is thinning. The twentieth century was possibly the hottest in the past thousand years. *Forests and climate change: a convenient truth*, a 17-minute video presentation produced by FAO and the Forestry Commission of the United Kingdom, shows how much forests can contribute to the mitigation of climate change, stressing the importance of reversing forest loss.

The video reveals the tree as the perfect "machine" to soak up and store carbon. It points out, however, that although forests store more carbon than all the world's remaining oil stocks, continuing deforestation and forest degradation account for almost one-fifth of the world's greenhouse gas emissions – more than the entire global transport sector. Yet some regions have managed to reverse negative trends.

A section entitled "Managing to mitigate" explains how society can combat climate change by conserving and managing existing forests, by tackling causes of deforestation and by planting new forests. The presentation stresses the use of wood as a renewable energy source and as a raw material, pointing out that wood products store carbon for their entire lifetime, until they decay or are burned. A section on adaptation notes how the world's changing climate will affect the health and composition of forests and stresses the importance of adapting and planning ahead for the changes.

This informative DVD provides concise and accurate insight into the many important services provided by forests and the perilous implications if the current trend of forest loss continues. With striking imagery and simple language, it is suitable for classroom, conference hall and individual viewing by all who care about the future of the planet. The multilingual DVD includes the presentation in Arabic, Chinese, English, French, Russian and Spanish. An Italian version is also available on request (FO-publications@fao.org).



Introduction to forests and energy

Forests and energy: key issues. 2008. FAO Forestry Paper No. 154. Rome, FAO. ISBN 978-92-5-105985-2.

Rising energy consumption and fossil fuel prices combined with increasing concern over greenhouse gas emissions and energy import dependence are driving the research agenda for fossil fuel alternatives for energy production. Forests are key in the global quest for alternative energy sources. Woody biomass offers high levels of energy efficiency and lower carbon emissions than fossil fuels. This publication considers the present and future contribution of wood in the production of bioenergy as well as the potential effects of liquid biofuel development on forests.

Following an overview of global energy supply and demand with projections to 2030, the publication considers the contribution of wood energy within a broader discussion of the various bioenergy crops used to produce first- and second-generation biofuels. It assesses the benefits of different sources of bioenergy and the dangers of forest conversion. It also discusses market forces and ongoing technological innovations for wood energy production. Policy options and recommendations for bioenergy development are provided, emphasizing the importance of integrated land use and the transfer of advanced wood energy technologies to developing countries.

This publication will be useful to both specialized and general audiences interested in learning more about the role of forests in energy production. It is also available in Arabic, Chinese, French, Russian and Spanish.

A personal face to forest management in the Philippines

Forest faces: hopes and regrets in Philippine forestry. 2008. RAP publication 2008/04. Bangkok, Thailand, FAO Regional Office for Asia and the Pacific & Environmental Science for Social Change (ESSC).

Forest management in the Philippines has shown dramatic successes and failures. A high rate of forest loss, together with

extensive civil society and media attention to deforestation, to forest governance problems and to indigenous people's rights, testify to the complex relationship between Filipino people and their forests.

Forest faces: hopes and regrets in Philippine forestry, offers a collection of personal stories and reflections to improve understanding of the hardships and misfortunes associated with loss and degradation of forests in the country. More than 50 interviews with Filipinos from many sectors and different generations provide a picture of the hopes, fears, satisfactions and frustrations of a population deeply connected to the forest.

The faces in this beautifully designed book, richly illustrated with photographs, include (among many others) policy-makers, scientists, tribal leaders, furniture makers, schoolchildren, urban professionals, forest nursery workers, farmers, forest guards, gatherers of wood and non-wood forest products, religious leaders, historians, sociologists and community workers. Issues discussed include upland poverty, flawed implementation of well-intentioned policies and the challenges of controlling illegal activities. Reflections on the past meet perspectives on what needs to be done today.

As noted at the outset, this publication supports Jack Westoby's well-known comment that "Forestry is not about trees, it is about people". It will be of interest well beyond the Philippines, to all those who are concerned with the relationship of forests and people.

Institutional change in forestry

Re-inventing forestry agencies: experiences of institutional restructuring in Asia and the Pacific. P. Durst, C. Brown, J. Broadhead, R. Suzuki, R. Leslie & A. Inoguchi, eds. 2008. RAP Publication 2008/05. Bangkok, Thailand, FAO Regional Office for Asia and the Pacific.

As the concerns of forestry increasingly extend beyond wood production to encompass social, environmental and cultural dimensions, forestry institutions must adapt. Does a great leap work better than a gradual transition? Is private involvement more important than public, and are smaller institutions better than large ones? Who benefits from devolution, and are there any losers? How can real change be distinguished from superfluous change?

This study of nine forestry institutions in China, India, Malaysia, Nepal, New Zealand, the Philippines, the United States and Viet Nam explores these and related questions.

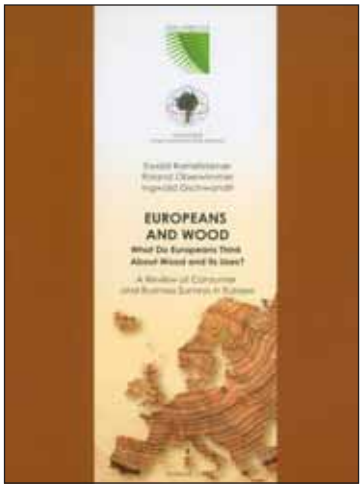
With increasing demands for conservation and services of forests, the responsible institutions must overcome the challenges that reform entails and prove their worth to society. Through a comparative analysis, this publication will help institutions considering reinvention better understand the issues, challenges and opportunities inherent in reforming forestry agencies in a rapidly changing world.

European attitudes about wood

Europeans and wood: what Europeans think of wood. E. Rametsteiner, R. Oberwimmer & I. Gschwandtl. 2007. Warsaw, Poland, MCPFE & FAO-UNECE Forest Communicators Network. ISBN 978-83-926647-0-3.

Changes in society's view of forests and a public orientation towards increasingly "green" economies are influencing the demands on forests as producers of raw materials, not only for increasingly sophisticated products but also for renewable energy. These changes have profound effects for forest policy-makers and forest owners and managers, who face new opportunities to engage in increasingly integrated value-added production and appropriate governance of resource use.

Europeans and wood provides a comprehensive look into public perceptions of forest-based products, based on consumer opinion polls and business surveys. The report, which complements *Europeans and their forests*, published in 2003 by the Ministerial Conference on the Protection of Forests in Europe (MCPFE) and the European Forest Communicators Network, reveals that Europeans generally have a positive attitude towards wood, finding it warm, natural and environment friendly. However, despite widespread environmental awareness, most Europeans are more likely to base their purchasing choices on quality, design and price than on environmental issues. The public is more aware of



environmental considerations for paper products than for other wood products. Furthermore, while the use of renewable energy is widely supported, most people think of renewable energy as solar, wind and hydropower; the current and future role of wood energy is not well recognized, and awareness of how the use of wood and wood energy can contribute to mitigating climate change is not high.

The document ends with a broader look at the image of the forest industry in Europe. Although the forest industry is not generally perceived as innovative or attractive for employment, on the whole it is deemed environmentally friendly. Perceptions vary widely, however.

This publication gives insight into the areas where further communication efforts would be valuable for a better informed public and better use of wood.

The Indian Ocean tsunami of 2004: a preventable tragedy?

The role of coastal forests in the mitigation of tsunami impacts. K. Forbes & J. Broadhead. 2007. RAP Publication 2007/1. Bangkok, Thailand, FAO Regional Office for Asia and the Pacific.

The role of coastal forests in the mitigation of natural disasters rapidly became an important topic of discussion following the 2004 Indian Ocean tsunami, which destroyed coastlines and left many dead. Some of the reconstruction efforts focused on rehabilitating and repairing coastal forests, an action prompted by the supposition that intact mangrove forests help alleviate the devastating impacts of tsunami events. However, because of a general lack of hard evidence the value of these efforts eventually came into question.

FAO produced *The role of coastal forests in the mitigation of tsunami impacts* to address the questions and to assemble scientific knowledge on the physical aspects of tsunami mitigation by coastal forests. It notes that the protection provided by these forests is related to the size and force of the tsunami, the

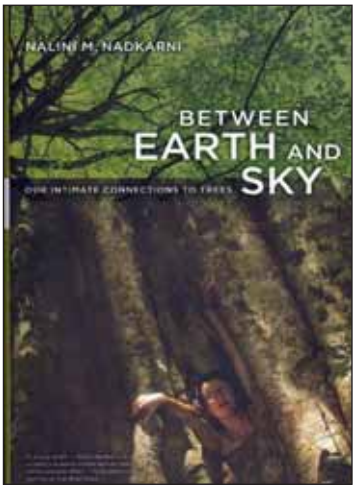
forest characteristics (width, height, density and distribution of vegetation) and the soil substrate. The diameter, height and elasticity of the trees are also factors. Coastal trees and forests may provide protection at lower costs than engineered coastal protection structures, while supplying additional benefits and services.

This small publication presents the current facts surrounding this topic. Although it cannot cover all of the issues related to the establishment of coastal forests, the information it contains, integrated with economic, social and environmental considerations, may contribute to improved coastal tree and forest management worldwide.

What trees mean to people

Between earth and sky: our intimate connection to trees. N. Nadkarni. 2008. Berkeley & Los Angeles, USA, University of California Press. ISBN 978-0-520-24856-4.

Between earth and sky: our intimate connection to trees is a personal, spiritual and poetic representation of the meaning of



trees. The author has gathered perspectives on trees and forests from scientists, students, artists, clergymen, musicians, activists, loggers, legislators and indigenous people on four continents and presented them in a passionate and beautiful tribute to nature. Through anecdotes, copious scientific facts, personal reflections, poems and illustrations she explores tree biology, the goods and services trees provide, their provision of shelter and protection and their role in health and healing, moving finally into the realms of human imagination, art, religion and spirituality.

This finely written book will give pleasure to and broaden the knowledge of all lovers of trees, forests and nature.

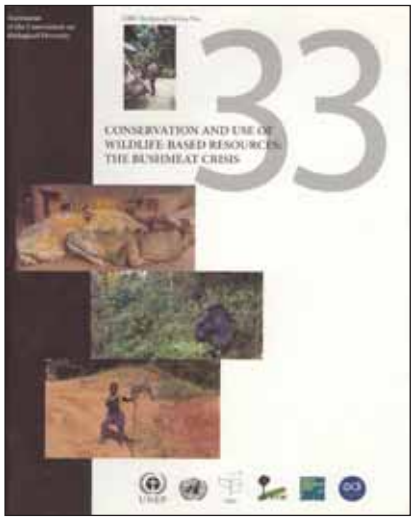
Two forestry papers from the Convention on Biological Diversity

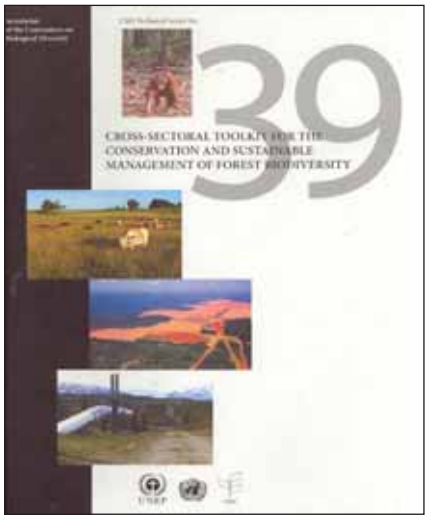
Conservation and use of wildlife-based resources: the bushmeat crisis. 2008. CBD Technical Series No. 33. Montreal, Canada, Convention on Biological Diversity.

In some countries unsustainable hunting of tropical forest wildlife for consumption as food, or bushmeat, is causing critical biodiversity loss. This paper presents a summary of existing knowledge on the crisis and puts forth policy options for sustainable use of wild fauna. It also examines interactions with other sectors, particularly forestry, agriculture and fisheries.

Conservation and use of wildlife-based resources: the bushmeat crisis makes clear the ecological importance of wildlife as well as the economic, nutritional, social and cultural value of bushmeat. It probes the factors surrounding sustainable and unsustainable hunting, with special attention to impacts on livelihoods and consideration of alternative forms of protein.

The publication ends with lessons learned and recommendations for action at different levels. It is intended to give impetus for coordinated responses to the increasingly urgent bushmeat crisis at international, national and local scales.





Cross-sectoral toolkit for the conservation and sustainable management of forest biodiversity. 2008. CBD Technical Series No. 39. Montreal, Canada, Convention on Biological Diversity (CBD).

Activities in many sectors can influence forest biodiversity. This toolkit looks beyond the forest sector to suggest policy approaches in agriculture, tourism, mining, land-use planning, energy and finance that will reduce negative consequences on forests and forest biodiversity. Proposed tools include laws, codes of conduct, incentives, policies and market-based instruments.

The publication demonstrates that opportunities for long-term economic development can be compatible with conservation of forest resources. The toolkit is intended to be updated regularly and to become an Internet-based instrument. It is a work in progress; additional sectors such as transportation and health will eventually be included.

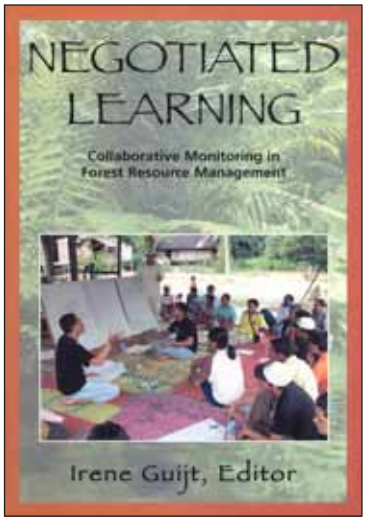
The toolkit, offering practical and applicable policy guidance, builds on previous work of CBD partner organizations including FAO, the Center for International Forestry Research (CIFOR) and the Global Environment Facility (GEF). It will assist countries to devise appropriate policy responses to increasing pressure on fragile forest resources.

Participatory forest monitoring

Negotiated learning: collaborative monitoring in forest resource management. I. Guijt, ed. 2007. Washington, DC, USA, Resources for the Future. ISBN 978-1-933115-38-2.

In participatory natural resource management, how can monitoring be carried out effectively in a collaborative way? *Negotiated learning* addresses this question through case studies and lessons learned from researchers and development specialists operating in 11 countries across Africa, Asia and South America.

Successful collective monitoring will emphasize community participation from indicator selection to decision-making based



on the information collected. The publication emphasizes the importance of local capacity building so that communities can eventually assume full responsibility for local forest resource management.

Case studies highlight best practices, focusing on four main lessons:

- the difficulty of using criteria and indicators in complex environments;
- the need to draw from and strengthen existing monitoring processes;
- the need to consider, manage and take advantage of differences among stakeholders at all levels;
- the importance of maintaining adaptive capacity in monitoring systems.

Throughout, *Negotiated learning* stresses that collaborative monitoring is a comparatively new area of practice; continued efforts will be required to improve the processes involved.

Support for forests in development cooperation

Forests sourcebook: practical guidance for sustaining forests in development cooperation. D. Chandrasekharan Behr, ed. 2008. Washington, DC, USA, World Bank.

The World Bank is the leading source of funding for forest development. *Forest sourcebook* provides information about all major World Bank initiatives in the forest sector. It is a comprehensive review of sustainable forest management in the context of international development cooperation.

Forests sourcebook includes contributions from leading experts in the various fields of international forestry. Forty chapters cover subjects such as forest governance, poverty, forest inventories, policy reform, information systems, decentralization, certification – in short, just about any topic related to forest development. It will be an indispensable reference for development agencies, international organizations, researchers, and university courses on international forestry.

One drawback is that the volume is so comprehensive that its usefulness for practical guidance may be limited. While the text is generally accessible, it is loaded with jargon and acronyms (the list of acronyms fills five pages) which may create a barrier to comprehension by bank outsiders.