

Changing perspectives for sustainable forestry in Brazilian Amazonia: exploring new trends

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1. Introduction

Issues related to territory, local governance and globalisation have changed tropical forest management in Brazilian Amazonia in the past decade. Firstly, there is the trend towards decentralised forest management, the devolution of land rights to local communities (in the form of indigenous and extractive reserves) and a more significant role for civil society organisations (CSOs) in forest management. Secondly, globalisation is resulting in trade liberalisation, expanding external markets for timber and soybeans and the spread of a worldwide concern about the fate of forests. While trade liberalisation and expanding world markets may provoke increased deforestation, globalising concern about the loss of the forest's ecological and livelihood services creates new market-driven incentives for sustainable forest management and donor support to community-based forest management. The outcome of the changes points in different directions. Many fear that the recent expansion of soybean cultivation and associated investments in road paving and improved waterways will give a further impulse to deforestation and predatory logging (Carvalho, 1999; Fearnside, 2001). Shifts in forest governance and market-driven incentives to sustainable forest management may, however, signal a trend towards more sustainability.

Focusing on the Amazonian timber industry, this paper explores the aforementioned trends and their implications for the prospects of developing more sustainable forestry. First, we will review conventional patterns in roundwood supply to the timber industry based on previous research in the Brazilian Amazon region (Ros-Tonen, 1993) and compare these with findings of studies carried out ten years later (Veríssimo *et al.*, 2003; Macqueen *et al.*, 2003). Based on a literature review, we then highlight the major trends we expect to influence

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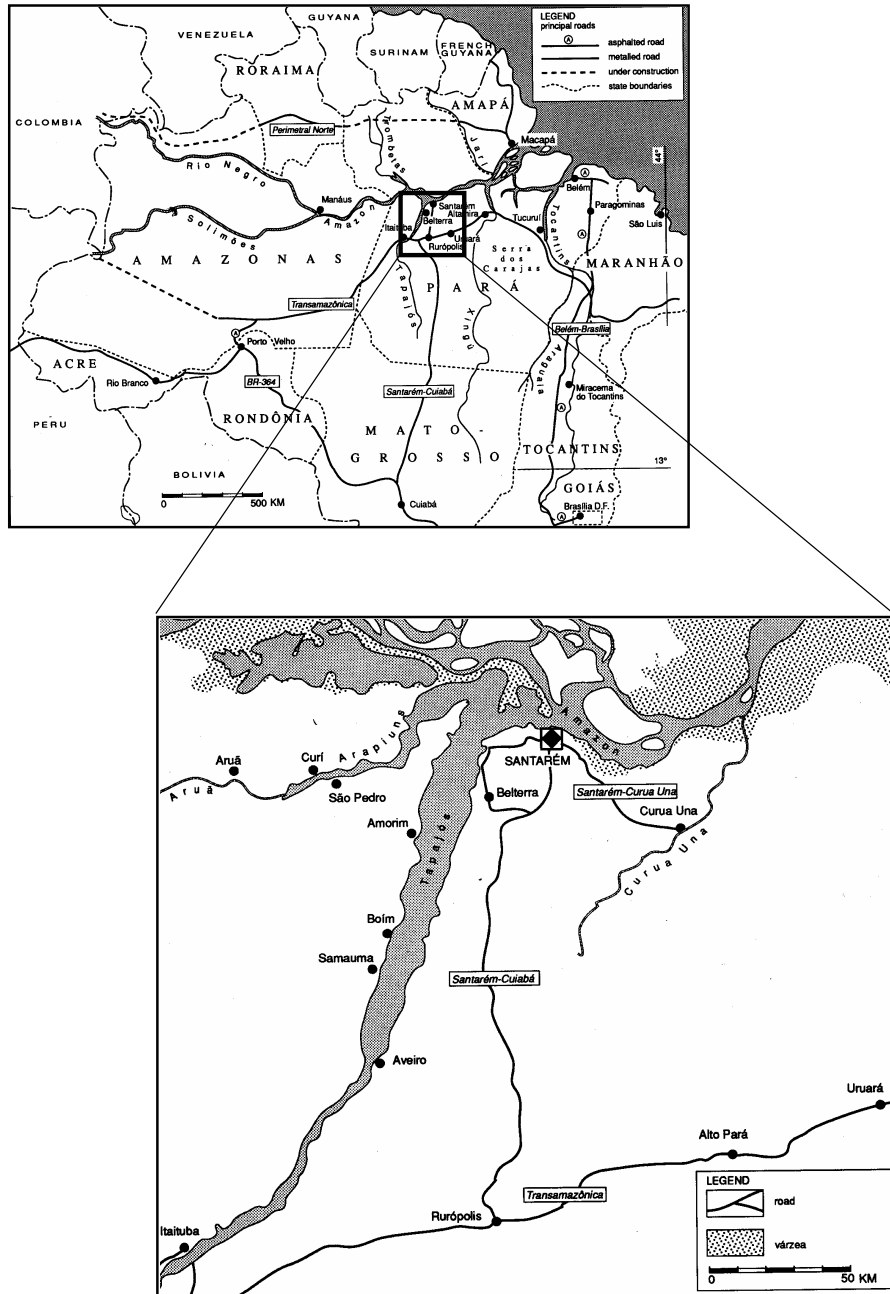
existing logging practices. We first look at the recent expansion of soybean cultivation and the associated investments in infrastructure. We then pay attention to how sawmills respond to the depletion of timber stocks in the most accessible areas due to the ageing of agricultural frontiers. The next trend we consider is the ‘positive side’ of globalisation, *i.e.*, the concerted efforts to conserve forests and manage them sustainably through international agreements, market incentives and global-local partnerships. Finally, we look at changing patterns in forest ownership and the consequent change of actors in forest management. We finalise by assessing the implications of these trends for sustainable forest management and propose some questions for research.

2. Conventional roundwood supply patterns in the early 1990s

In a study carried out in Western Pará, Brazil, in the early 1990s (Ros-Tonen, 1993; see Map 1), we found that the way logging and roundwood supply patterns in the Amazonian timber industry were shaped was closely associated with the sawmill’s location relative to its roundwood source. An essential aspect in this respect was the distinction between seasonally flooded *várzea* forests along rivers and non-flooded upland (*terra firme*) forests accessible by roads. This distinction determined which species were exploited, what technology was used and what kind of labour relations prevailed.

Traditionally, that is in times that forests were hardly accessible over land, almost all roundwood came from *várzea* forests. In the early 1990s, however, we estimated that 85 per cent of all roundwood originated from upland forests in recently opened and occupied areas. As a result, much roundwood came from tracts of forests that were to be converted into farming land and pasture. We estimated that wood from clearings for agricultural land uses made up 71 per cent of all roundwood inputs of the sawmills in the Santarém region and 49 per cent of total log consumption of the surveyed companies in Belém (Ros-Tonen, 1993, p. 75).

A second distinctive feature of logging in Brazilian Amazonia was that less than half of the sawmills engaged in logging themselves. Autonomously working lumbermen played an important role in roundwood supply.



Map 1 The Santarém region

2.1 Roundwood supplies by autonomous lumbermen

The autonomously working lumbermen, locally referred to as *madeireiros* or *toreiros*,¹ earn their living by felling, transporting and/or selling logs.² The typical lumberman of the upland forest is the owner of a logging truck (Figure 1) and often a small landholder who may combine logging with farming. In the early 1990s, an estimated 60-70 lumbermen were active



Figure 1
Typical logging truck as used in operations of low technological level. It is equipped with a manually operated winch and steel cable to load the truck. The system is referred to as the catraca (ratchet) system.

in the Santarém region. At the time, most of them lived in or near the city of Santarém. They were engaged in both logging and transportation, usually with help of three men: a chainsaw operator and two labourers to clear the logging road and load the truck. Equipment was restricted to a logging truck, chainsaw and machete. The forest tracks that were logged belonged either to the lumberman himself or to farming colonists who had settled along the roads and had planned to clear the forest to plant their crops. Large landholders usually hired labourers to do the felling, often in combination with an investment in a mobile sawmill to saw the logs. Other *fazeindeiros* made a deal directly with a sawmill or timber company to log their area, without interference of a lumberman. Deals between lumbermen and large landholders were therefore not common, in contrast with deals between small landholders and lumbermen.

In 1989, lumbermen provided 80 per cent of all logs used by the sawmills in our survey and 42.2 per cent of the sawmills depended entirely on lumbermen for their roundwood

supplies (*ibid.*, p. 75 and 85). At the time, the organisation and high costs involved in logging operations meant that even the larger sawmills preferred buying logs from third parties. Another explanation for the important role of lumbermen must be sought in the traditional labour relations prevailing in the Amazonian extractive economy, known as the *aviamento* system. Under this system, the extractor receives an advance in merchandise, tools and/or money in exchange for the physical product at the end of the expedition. Many features of this system still prevail in the extraction of forest products, including timber. These labour relations are still widespread, albeit sometimes in an adapted form.

The prevalence of traditional *aviamento*-based labour relations in logging operations was most visible in isolated *várzea* forests where the extractors worked with simple means of production. Whilst they worked in the forest, money was of no value. They depended on timber merchants who acted as intermediaries between them and the timber industry and who organised the transport of logs to the sawmill. These merchants often received money in advance in order to be able to deal with the loggers, who stayed in the forest for long periods (ranging from a few weeks in the Islands region in Pará to eight months in the state of Amazonas). The merchants provided them with basic necessities such as cassava (*farinha*), dried fish and meat, beans, salt, sugar, coffee and tobacco. Furthermore, the extractors were provided with rings and steel cables to prepare the rafts for the buyer. The chief logger (*chefe da turma*) might also receive money in advance to contract his helpers – the *diaristas* – and for his family members who stayed behind in the village during the logging operation. The advances in general did not exceed 30 to 45 per cent of the total value of the expected delivery (Almeida, 1985 and pers. comment 1988; da Silva, 1987 and pers. comment 1988).

2.2 Logging operations by sawmills

The sawmills that employed their own logging crew (57.5 per cent of the total number surveyed) operated at various levels of scale and technology, depending on the amounts of roundwood needed. At low level (44.4 per cent of the sawmills with own exploration), two to four men worked together in a small team, with technologies that resembled those used by autonomous lumbermen. At medium level (41.7 per cent), in addition to a logging truck and chain saw, one other machine was used. This was usually a tractor, but occasionally also a front-end loader (*carregadeira*) or bulldozer (*esteira*). Large sawmills and timber companies (13.9 per cent) had logging crews of 20-30 men, all working under a rigid division of labour,

conditioned by the machines and equipment available. In these instances, specialised forestry equipment was used, including front-end loaders, bulldozers and skidders. A foreman (*capataz*) was commissioned to coordinate the work. Productivity ranged from 40-200 m³ per day, with an average of 100 m³ per logging crew. Besides the personnel in the forest, there was also a cook and his mate who prepared the meals and ran the camp.

Another characteristic of timber exploitation in the early 1990s, which contrasts with the situation in countries where the concession system prevails, is that much of the logging in upland forests took place in areas owned by third parties (*terceiros*). Only 49 per cent of the surveyed firms logged areas they considered their own, which was mostly the case in the colonisation areas. 61 per cent of the surveyed sawmills regularly made a deal with agricultural colonists who exchanged trees for money, sawnwood, the construction of a secondary road (*ramal*), or machine loans. The selling of trees or logging rights thus provided both peasants and cattle-raisers with the financial or technical means for the conversion of forests into farming land or pasture.

Public land (*terra devoluta*) was exploited only in the periodically flooded forests (*várzeas*) and more isolated parts of the upland forests (by 17 per cent of the sawmills surveyed). This was only economically attractive in the case of valuable species (such as mahogany, which was extinct in the more accessible areas) or if the logger or sawmill owner intended to claim the land as his own for future use. The latter was possible as Brazilian law acknowledges the right to land through its appropriation (*direito de posse*) by those who have lived on and cultivated unclaimed public land for at least one year and one day. If a *posseiro* lives on and cultivates the land for more than ten years, he has rights to the land title. In practice, many large companies and speculators succeeded in claiming the land without fulfilling these conditions, as a result of which many sawmill owners already considered these areas as their own.

The conditions under which roundwood was provided to the sawmills did not make a sound basis for the sustainable management of forest resources. Most sawmills had no direct links to the roundwood source, and where they did have this, they tended to convert their forest to farmland. Operating a sawmill was for colonists mostly a temporary and collateral activity to benefit from valuable timbers that became available from clearings. Only a small minority of sawmills engaged directly in logging with the primary purpose of timber exploitation. Although these were the only potential actors to invest in sustainable forest

management, cheap tropical hardwood supplies from clearings by colonists and cattle ranchers discouraged them to do so. In sum, the close association between the timber industry and the expansion of agricultural frontiers in Brazilian Amazonia seriously hindered the development of sustainable forestry, which was hardly able to compete with cheap timber from unsustainably managed sources.

3. The situation today

More recent diagnostic studies of the timber industry in Pará (Veríssimo *et al.*, 2003) and the Brazilian Amazon region as a whole (Macqueen *et al.*, 2003) largely confirm the patterns described above (Table 1). There is still a strong relationship between colonisation and timber exploration, as witnessed by the emergence of new timber-processing centres (*polos madeireiros*) in recently opened up colonisation areas such as Novo Progresso in Western Pará and the declining production in the old frontier areas of Southern and Eastern Pará where forest resources are being depleted. Smeraldi (2003) estimates that around 22 million m³ of legally extracted wood was brought onto the market in 2001, as a result of the legalisation of spontaneous settlements under the Land Reform law and the authorised conversion of around 1.1 million hectares of tropical rain forest to farming land.^{3 4}

Table 1 Main features of roundwood supply in the early and late 1990s

Feature	Ros-Tonen (1993)	Veríssimo <i>et al.</i> (2003)
Roundwood source		
- Owned by the sawmill	49%*	36%**
- Third parties	61%*	55%**
- Public areas	17%*	9%**
Proportion provided by lumbermen	80%	51%
Proportion of sawmills depending on lumbermen	42%	80%/50%/25%***
Proportion of roundwood originating from clearings	71%	n.a.
Proportion of sawmills logging at low technological level (<i>catraca</i> system)	39%	11%

* Proportion of sawmills; more options possible so total is larger than 100 per cent.

** Proportion of roundwood.

*** Among small, medium-sized and large enterprises, respectively.

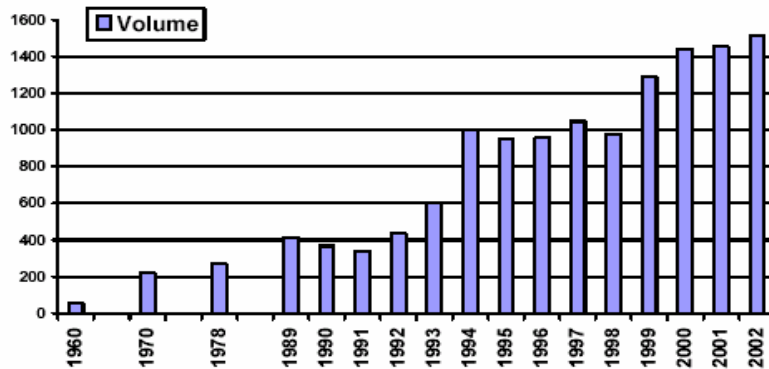
Moreover, little seems to have changed with respect to tenure of the roundwood source: Veríssimo *et al.* found that 36 per cent of the roundwood used in Pará in 1998 came from forest land owned by the sawmill, 55 per cent from third parties and 9 per cent from public areas (Table 1).

Autonomous lumbermen still play an important role in the provision of roundwood, although the various sources indicate different trends. Data presented in Veríssimo *et al.* (2003) suggests a declining role for lumbermen: the authors estimate that 51 per cent of all roundwood utilised in the Santarém region was provided by autonomous lumbermen in 1998, whereas this proportion amounted to 80 per cent in our 1989 survey (Ros-Tonen, 1993). In the new timber-processing centres in Western Pará the proportion of sawmills that depend on third parties is even lower: here 78 per cent of the sawmills undertake their own exploration and only 22 per cent rely on autonomous lumbermen (*ibid.*, p. 34). However, according to Lima & Merry (2003, p. 76) the proportion of sawmills that depend for 80-100 per cent on third parties is still substantial: 80 per cent for small sawmills, 50 per cent for medium-sized sawmills and 25 per cent for the large enterprises. The latter is remarkably low compared with the 89 per cent for the large enterprises we interviewed in Belém ten years earlier.

For the state as a whole an up-scaling of the machinery used seems to have occurred. According to the inventory by Veríssimo *et al.* (2003) a logging truck is used in 11 per cent of the logging operations in Pará. This seems to be low compared to what we found in our 1993 study (39 per cent of the sawmills with own operations and all operations by lumbermen). In the Santarém region, however, 65 per cent of the logging operations are still undertaken using a logging truck (Veríssimo *et al.*, 2003, p. 35), which is high compared to the other timber zones identified in their study (ranging from 0-4 per cent in Southern and Eastern Pará to 25 per cent in Western Pará and 31 per cent in the Islands region).

Although a large part of the Amazonian timber industry still works with obsolete material, Smeraldi (2003, p. 38-39) notes that two measures in the early 1990s facilitated the import of high-quality technology: the abolition of tariffs on equipment produced outside Brazil and the exemption from payment of the ICMS (*Imposto sobre a Circulação de Bens e Serviços* – comparable to the VAT) for the export of primary and semi-processed goods and the acquisition of capital goods. These measures enabled the Amazonian timber industry to import skidders, trucks and other equipment previously beyond the reach of most enterprises. Although this seems not to have changed the industry's technological level as a whole, it has had a tremendous effect on timber exports which have risen by 450 per cent since the mid-1990s (Figure 2). This suggests that only the largest companies scaled up the technology in logging operations. These companies are the ones that are oriented towards the export market. Instead of relying on autonomous lumbermen (as they did in the early 1990s) an increasing

number of these companies now carry out the logging themselves, making use of advanced machinery that they now can acquire more cheaply.



Source: Ministério da Indústria e Comércio (MDIC), Secretária de Comércio Exterior (SECEX), Companhia das Docas do Pará (CDP). (Taken from Smeraldi, 2003, p. 39).

4. Expansion of soybean cultivation as a catalyst for predatory logging

The relationship between logging and agricultural development at the forest frontier received a new impulse in the past decade through the expansion of soybean cultivation. Soybean cultivation in the Brazilian Amazon nearly doubled in the past decade from 11.7 million hectares in 1994 to 21.0 million hectares in 2003 (USDA/FAS, 2004). It was driven by a booming world demand, which rose by 52 per cent during this period (*ibid.*). The demand comes from Europe where soy meal is used to feed poultry and pigs, and from Asia where soy is consumed as oil (Fearnside, 2001). Fearnside notes that the demand for Brazilian soybeans received an impulse in particular after the collapse of the Peruvian anchovy fisheries in the 1970s and the concomitant decline in fishmeal supplies. Declining soy yields in the US were another catalyst to the demand for Brazilian soybeans. Finally, the introduction in the 1990s of high-yielding tropical soybean varieties adapted to the growing conditions in the Brazilian Amazon ‘let the Genie out of the bottle’ (USDA/FAS, 2004).

The expansion of soybean cultivation differs from earlier occupation processes in the Amazon by being driven by external markets (Fearnside, 2001). Past factors provoking massive deforestation in the Amazon were driven mainly by national policies. Examples are the extensive road construction programmes in the 1960s to open up the region, the fiscal incentives to stimulate investments in cattle ranching and agro-industries and the colonisation

programmes to resettle poor landless farmers from the Northeast and the South (see, for example, Kleinpenning, 1977 and 1978 and Mahar, 1990). Even logging in Brazilian Amazonia, in contrast to the situation in many other tropical countries, is driven mainly by domestic demand which, according to Smeraldi & Veríssimo (1999), absorbs 86 per cent of the total timber production.

In order to get the soybeans to the external markets, heavy investments have been made in the improvement of waterways and road paving (Carvalho, 1999). The government's *Avança Brasil* ('Forward Brazil') programme of 1999 envisaged a US\$ 43.6 billion investment in infrastructure, of which an estimated US\$ 20.1 is destined for road building and paving, the construction of ports, airports, railways and cargo facilities, the canalisation and dredging of waterways and other projects that are likely to affect forests (Laurence *et al.*, 2001). It is expected that the 6,245 km of paved highways planned under this programme would nearly double the forest area available to loggers for the opening up of hitherto inaccessible areas (Carvalho *et al.*, 2002). The expansion and paving of the road network will further stimulate logging activities because of lower transportation costs, which makes the exploitation of more species profitable. The newly paved roads also allow larger volumes to be transported. These effects taken together are likely to lead to the intensification of logging in the 50 km zones adjacent to the improved roads (Nepstad *et al.*, 2002b; Carvalho *et al.*, 2002). In Novo Progresso along the Santarém-Cuiabá (BR-173), for example, the number of sawmills increased from 10 in 1997 to 60 in 2000 in anticipation of road paving and potential savings in transportation costs (Carvalho *et al.*, 2002).

Several authors fear that the improved waterways and roads will stimulate illegal logging. Fearnside (1997; 2001), for example, claims that the Santarém-Cuiabá Highway is already a major source of illegally cut mahogany and that its paving would give a new impulse to illegal logging. Carvalho (1999) expects that the improvement of waterways will stimulate illegal logging as well, by providing an outlet for wood felled without proper licenses.

As regards the relationship between the expansion of soybean cultivation and deforestation it should be noted that it is mostly an indirect one. The preferred location for soybean plantations is on degraded soils – usually former pastures – and other already deforested areas, because these require less fertilisation with lime than the more acid forest soils (Carvalho, 1999). Many smallholders are currently being expelled from their lands as a

consequence of advancing soybean plantations (*ibid.*). These displaced farmers face the choice of migrating to nearby cities or moving deeper into the forest where they clear new land. In the latter case, the model of colonisation-related logging and sawmilling described above is being reproduced in the new frontier areas.

5. Recent changes that may curb the trend

The above suggests that basically little has changed in roundwood supply patterns and that the expansion of soybean cultivation will only perpetuate and strengthen predatory exploitation forms. There are, however, several trends we expect to influence roundwood supply patterns and the prospects for sustainable logging:

1. Increasing scarcity of timber in the most accessible areas.
2. New market and donor-driven incentives for sustainable industrial and community-based sustainable forest management.
3. Changing patterns of forest ownership.

5.1 Increasing scarcity of roundwood resources

Sawmilling in the Amazon is a highly mobile activity, which follows the dynamics of the agricultural frontier as long as roundwood is supplied from clearings of virgin forest for agriculture. The sawmills are run until the roundwood supplies in the direct neighbourhood are depleted (Scholz, 2001). The machines are then sold and their former owners focus on farming again. This process is illustrated by the recent age of establishment of most sawmills: in 1989 about half of the surveyed sawmills were less than five years old (Ros-Tonen, 1993). Also data collected by Veríssimo *et al.* in 1998 revealed that half of the enterprises in Pará had started their activities in the 1990s (ranging from 24 per cent in the Islands region, to 53 per cent in the older frontier areas and 100 per cent in the new colonisation areas in Western Pará). The sawmills are more mobile than their owners: our survey in 1989 indicated that 71 per cent of the sawmills along the Transamazônica were bought second-hand after having been in service for one or more previous owners at another location for many years.

A study carried out by Stone (1997, 1998) reveals the economics of this relocation process in situations of increasing timber scarcity. He used an adapted version of the 18th century Von Thünen location model to analyse the dynamics of the timber industry along an ageing frontier. The distance to markets, level of transportation costs, net timber prices and

degree of certainty about property rights appeared to affect the spread and development of the timber industry and the willingness to invest in sustainable forest management and advanced technologies. Initially, firms cope with increasing scarcity of forested land by investing in larger trucks (to bridge larger distances and reduce transportation costs) and advanced technologies (to reap economies of scale). When scarcity increases further, the sawmills are confronted with the choice of re-investing in stocks of natural capital (an option for larger sawmills and wood-processing industries), closing (the best option for small sawmills) or relocating to more remote areas and starting the cycle anew (Stone, 1998).

Scholz (2001) found that most entrepreneurs respond defensively to timber scarcity by calling for subsidies and changes to the forest statute. She expects little to come from the option of investing in sustainable forest management, because the limited number of marketable species makes exploitation forms other than selective logging unprofitable. She therefore considers the option of creating plantations a more plausible one than investing in the sustainable management of highly heterogeneous natural forests. Since this option is only feasible for large companies, the expectation is that most sawmills will close and be re-opened elsewhere when timber in a particular location becomes scarce.

5.2 Market and donor-driven incentives for sustainable forest management

It has often been feared that economic globalisation – the growing interconnectivity of international markets as a result of expanding global trade and worldwide investments and capital flows – would be a threat to tropical forests. It would open up markets and boost international demand for legally and illegally logged hardwood and other commodities. In the light of recent developments in soybean cultivation, the opponents seem to be right. There is, however, another side to the matter as the same process spreads a worldwide concern about the loss and degradation of tropical forests and their global ecological values such as biodiversity, carbon sequestration and watershed protection. An increasing number of forest-related conventions and agreements emerged to protect these global values, together with those at local livelihood level such as the supply of food, medicines, timber and fuelwood, and recreational, religious and spiritual values (Bass, 2002) (Box 1).

Although Brazil has always stressed that the development and conservation of its forests is a matter of national sovereignty, it has linked up with the International Forest Policy Dialogue described in Box 1 and developed its National Forest Programme (Ministry of the

Box 1 Global forest governance in the wake of Rio-92 (UNCED)

The first agreements dealing with tropical forests – the International Tropical Timber Agreement of 1983 and the Tropical Forestry Action Programme (TFAP) launched by Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the World Bank and the World Resources Institute (WRI) in 1985 – still focused strongly on the forest's production functions. The UN Conference on the Environment and Development (UNCED or Rio-92) marked the beginning of a new era in which concerns about the ecological and other non-economic functions of forests are receiving increasing attention. Although the intention was to reach an agreement about a Global Forest Convention, only a Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Forest Types ('the Forest Principles' for short) was adopted at UNCED, together with Chapter 11 on Combating Deforestation in Agenda 21. Both documents recognised the need for biodiversity conservation and the protection of indigenous rights. In addition, the UN Convention on Biological Diversity and the UN Framework Convention on Climate Change adopted at the UNCED both include aspects related to forest conservation and management (Wiersum, 2000). Since then, there has been a discernible trend towards global forest governance; a process referred to as the International Forest Policy Dialogue. As a result of this dialogue, the UN established the Intergovernmental Panel on Forests (IPF; 1995-1997) and its successor – the Intergovernmental Forum on Forests (IFF; 1997-2000) – to implement the Forest Principles and Chapter 11 of Agenda 21. Between 1995 and 2000 the IPF/IFF dealt with the underlying causes of deforestation, traditional forest-related knowledge, international cooperation in financial assistance and technology transfer, the development of criteria and indicators for sustainable forest management, and trade and the environment (UNFF, 2004). An increasing number of countries, including Brazil (Ministry of the Environment, 2002) are attempting to implement the Forest Principles at national level through the development of National Forest Programmes.

In 2000, the United Nations Economic and Social Council (ECOSOC) established the United Nations Forum on Forests (UNFF) as part of a new (legally non-binding) International Arrangement on Forests, to create a more permanent home for the international dialogue on forests and exchange experiences among governments and other stakeholders in sustainable forest management (*ibid.*). Together with the UNFF, a Collaborative Partnership on Forests (CPF) was formed to support the UNFF, consisting of 14 international organisations dealing with forests.¹ The two components of the International Arrangement on Forests were 'to promote the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end' (ECOSOC Resolution 2000/35).

Besides the UN-related processes described above, an independent World Commission on Forests and Sustainable Development (WCFSD) was established in the wake of UNCED, with the aim being to (i) increase awareness of the dual function of world forests in preserving the natural environment and in contributing to economic development; (ii) to bridge the gap between North and South; and (iii) to broaden consensus on data, science and policy aspects of forest conservation and management (WCFSD, 1999).

¹ The 14 organisations include the Centre for International Forestry Research (CIFOR), the Food and Agriculture Organisation of the United Nations (FAO), the International Tropical Timber Organisation (ITTO), the International Union of Forestry Research Organisations (IUFRO), the Secretariat of the Convention on Biological Diversity (CBD), the Secretariat of the Global Environmental Facility (GEF), the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), the Secretariat of the United Nations Forum on Forests (UNFF), the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the World Agroforestry Centre (ICRAF), the World Bank, and the World Conservation Union (IUCN).

Environment, 2002). It was also one of the eight countries taking the initiative to develop the UNFF. However, most international agreements and processes mentioned in Box 1 have probably had little impact on how the Amazon forest is being managed in practice. More

influence seems to come from three other initiatives and processes that emerged or gained ground in the 1990s:

- The Group of Seven⁵ most industrialised countries' initiative to set up the Pilot Programme for Conservation of Brazilian Rainforests (PPG-7);
- The creation of niche markets for environmental services and sustainably produced timber and non-timber forest products, particularly for certified timber.
- The emergence of global-local partnerships for forest conservation and sustainable use.

5.2.1 The Pilot Programme for Conservation of Brazilian Rainforests (PPG-7)

The PPG-7 was set up in 1992 as a partnership between the Brazilian Government, Brazil's civil society, the international community and the World Bank with the aim being to promote the conservation and sustainable use of tropical rain forest resources and reduce deforestation and CO₂ emission rates. Apart from the G-7 countries, funding comes from the European Union, the Netherlands and Brazil itself, totalling about US\$ 340 million.⁶ The World Bank administers the multi-donor Rain Forest Trust Fund and coordinates the programme together with the Brazilian government. The PPG-7 has been instrumental, in particular, in strengthening civil society organisations dealing with the Amazon region and in stimulating new forms of cooperation and participation in Brazilian public administration (Scholz, 2003). Among other activities, the PPG-7 provided institutional support to the *Grupo de Trabalho Amazônico* (GTA), a network of 630 environmental, community-based and other civil society organisations in the Amazon region, which is now a decisive factor in policy and decision-making with regard to the region's development. Moreover, community-based forest management schemes received an impulse through the 'Demonstration Projects' (PD/a) part of the PPG-7 programme. Since its inception in 1995, the Demonstration Projects line under PPG-7 supported almost 100 community-based projects, with an average grant of US\$ 140,000 each.⁷

5.2.2 Market-based instruments

Another globalisation-related trend that might change forest management practices is the creation of market-based instruments for sustainable forest management. During the past decade, several efforts have been made to enhance sustainable forest production through the market, for instance through the trade in environmental services and forest certification. What

such market-related incentives have in common is that they seek ways to compete with more lucrative, but also more destructive land uses, with the aim being to contribute to forest conservation, sustainable forest use and/or improved livelihoods for the poor in tropical forest areas. Part of these incentives aim at conserving environmental services such as biodiversity, carbon sequestration and watershed protection (see Pagiola *et al.*, 2002 for a review of market-based approaches to forest conservation). Others, such as the certification of timber or non-timber forest products from sustainably managed sources, aim to improve forest management practices so that forest products are generated in an ecologically sustainable, economically feasible and socially equitable manner.

In particular, consumer pressure for sustainably produced timber might lead to changed management practices. With support from GTZ and WWF Brazil, eighteen leading social and environmental organisations in Brazil formed a Forest Stewardship Council (FSC) Working Group in 1997 to define nationally appropriate criteria and indicators for sustainable forest and plantation management (May, 2002; Freitas, 2003). In 2001, the working group was officially recognised as an FSC National Initiative and standards for Amazon upland forest management became official in 2002. There are currently about ten certified forest sites in the Brazilian Amazon, together covering a forest area of about 437,000 ha and involving 1.5 per cent of the wood produced (Freitas, 2003). These certified forests not only involve private enterprises, but also three community-based management schemes engaged in the sustainable production of timber and non-timber forest products (*ibid.*). Although these experiences signal a positive trend towards responsible forest management, several factors hinder more widespread certified wood production in the Brazilian Amazon. These factors include a lack of clear tenure arrangements, a lack of qualified personnel, poor access to information, an unclear and unstable regulatory framework, lack of credit facilities and last, but not least, unfair competition with cheap roundwood from clearings and illegal sources (May, 2002; Freitas, 2003).

5.2.3 Global-local and corporate-community partnerships

The third outcome of the globalisation of environmental concerns is that local actors in forest management are increasingly becoming connected with international actors, such as environmental NGOs and research organisations lending support to sustainable forest use. This results in new forums for stakeholder negotiations, partnerships, alliances and joint

actions for the conservation and sustainable management of forests. At local level, partnerships for the protection and co-management of forest resources are emerging between international donors, government agencies, national and international NGOs, private sector actors, research organisations and communities.

In Pará, such multi-scale and multi-stakeholder partnerships for sustainable forest management include the GTZ ProManejo programme for sustainable forest management and the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) in the National Tapajós Forest, community forestry programmes under the PPG-7 and MAFLOPS. The latter is a company-community partnership between a small logging company and smallholders along the Santarém-Cuiabá road (BR-163) aimed at sustainable timber extraction at smallholder level (Lima *et al.*, 2003; Nepstad *et al.*, 2003). There are also narrow links between national and international research organisations, which have led to a number of research institutions which are having a strong impact on Brazilian forest and development policies for the Amazon region. Examples are the Man and Environment Institute for the Amazon (IMAZON), which has strong links with Pennsylvania State University, and the Institute for Environmental Research (IPAM) with substantial involvement of researchers from the Woods Hole Research Centre and the Federal University of Pará. Moreover, the Centre for International Forestry Research (CIFOR), a Consultative Group on International Agricultural Research (CGIAR) institution with headquarters in Bogor, Indonesia, has set up a regional office for forestry research in the Amazon jointly with the Brazilian Federal Agency for Agricultural Research (EMBRAPA). All these initiatives taken together provide the scientific basis of ecologically sustainable and socially responsible forestry.

5.3 *Changing patterns of forest ownership*

There is a discernible trend worldwide towards decentralised forest management and the devolution of land rights to local communities that is changing the actors involved in forest management. White & Martin (2002) calculated that the share of forest land under private or public community or indigenous ownership in the 18 countries with the largest forest cover amounts to 21.9 per cent. This implies that the share has doubled over the past 15 years. Scherr *et al.* (2003) expect this share to increase in the near future, since communities are increasingly reclaiming their rights to forest land and an increasing number of countries are implementing laws recognising these rights.

In Brazil, the portion of forest land under community ownership is lower than the average indicated above, namely 13 per cent. There are, however, two trends that indicate a further decentralisation of forest ownership. Firstly, the federal law created the opportunity in 1990 to delimitate extractive reserves, where forest-dwelling communities can sustainably exploit the forests for rubber, Brazil nuts and other forest products, while offering protection from encroachment by farmers and loggers. To date, twelve extractive reserves have been created in the Amazon region, covering 3,3 million hectare and involving 22,362 people (www.ibama.gov.br).⁸

Secondly, there is an increasing trend towards decentralisation of forest management to state and municipal level. A comparative study published recently on municipal forest management in Latin America (Ferroukhi, 2003) notes that Brazil's municipal governments have gained considerable autonomy and have received favourable federal funds and tax transfers since the new Constitution of 1988. Their powers in health and education compare favourably with the situation in five other Latin American countries, but their powers in natural resource management are lagging behind. Forest management in Brazil is still mainly the responsibility of the federal government, through the Brazilian Institute for the Environment and Renewable Resources (IBAMA). Compared to the situation in the early 1990s, however, government bodies at lower government levels have gained more competencies to delimitate protected areas and production forests and to impose forest use and management regulations. They do not, however, always use these powers because they give priority to urban development and the modernisation of agriculture and the timber industry rather than to forest conservation and sustainable resource use (Toni, 2003, p. 169). Factors that determine whether or not local forest and conservation policies are being developed and implemented include (i) the political willingness of a mayor or governor; (ii) the links between municipal, state and federal government; (iii) the strength of local civil society; and (iv) the presence of national or international NGOs and donors with an interest in forest conservation (Toni, 2003, p. 172-174). With respect to the latter, the PPG-7 has, in particular, played an important role. Where this constellation of factors leads to a state or municipal government taking an interest in implementing local environmental policies (like in various municipalities in Acre), forest conservation and sustainable use may be enhanced. However, it could also lead to uncertainty among forest users, who may find it increasingly difficult to comply with overlapping forest regulations (Tomaselli, 2001).

A third trend in forest ownership is the creation of National Forests (*Florestas Nacionais* or Flonas) for the sustainable production of timber and non-timber forest products and maintenance of ecological services. Currently, Flonas comprise less than 2 per cent of the Brazilian Amazon (83,000 km²), but the Brazilian government intends to expand the area of national, state and municipal forests to a total of 50 million ha by 2010 (Ministry of the Environment, 2002). In this way, the government hopes to curb the current boom-and-burst cycle of logging operations. Thus far, experiences with sustainable logging operations in Flonas are limited to some public-private partnership experiments in the Flona Tapajós. As long as sustainably produced timber has to compete with supplies of cheap hardwood from nearby colonisation areas, it is to be expected that timber production in Flonas will be limited, but their demarcation can complement other protected areas (Veríssimo *et al.*, 2002) and act as a buffer against further expansion of farm land and predatory logging.

5. Discussion: perspectives for forest management

Based on the above, we expect that only large and/or specialised companies, which have the means to invest in advanced technologies, natural forest management or plantations and which are capable of meeting the quality standards of European and American consumers, will be able to serve the international market for certified timber. With increasing timber scarcity near urban centres and the most accessible areas and growing consumer pressure to produce on an ecologically sound and socially acceptable basis, an increasing number of large firms will seek ways to benefit from the premium paid for timber from sustainably managed sources.

For small and medium-sized producers this option is less realistic. These sawmills operate with obsolete machinery, have low profit margins and produce sawnwood that mostly does not meet the standards of the export market. They are set up, remain operational for a few years and close or relocate in line with the dynamics of the agricultural frontier and those of the expanding soybean cultivation. A crucial factor for the prospects for sustainable forestry in Brazilian Amazonia is whether these small-scale producers can play a role in developments aimed at a more sustainable timber industry.

It has been suggested that the devolution of land to communities and smallholders, combined with increasing timber scarcity, could stimulate company-community partnerships for the sustainable production of roundwood (Scherr *et al.*, 2003). The first examples of such partnerships in the Brazilian Amazon already exist, as in the case of MAFLOPS described by

Lima *et al.* (2003). These authors point to the mutual benefits of deals between sawmills and colonists: cheap and legal timber supplies for sawmills from areas already opened up by roads, while colonists acquire help with the legally required forest management plan and receive money and/or other benefits such as transportation by logging trucks. In general, however, the ones who benefit most from these deals are the sawmills (*ibid.*, p. 84). The prices paid to the colonists are up to ten times below market value, the payments are often delayed and other benefits are of a temporary nature (as long as their area is being logged). Furthermore, the colonists have little say in the species and volumes exploited and the techniques used (*ibid.*, p. 85). Lima *et al.* therefore propose the ‘family forests’ concept, based on the MAFLOPS experience, as a more equitable company-community partnership for the sustainable production of timber. This would also fit the aim of the National Forest Programme to have an area of 20 million ha in private properties in the Amazon under sustainable forest management through ‘enterprising partnerships’ (*Parcerias Empreendedoras*) by 2010 (Ministry of the Environment, 2002, p. 65).⁹ It would be worthwhile investigating the feasibility of and receptivity towards this concept among sawmills and colonists .

It should be taken into account that smallholders in colonisation areas are not only suppliers of hardwood, but may also be sawmill owners themselves. These, generally small, sawmills lack the means and profit margins to invest in sustainable forest management. Often, their owners have no intention of doing so either because they operate the sawmill on a temporary basis. The challenge is to find incentives for these family-based sawmills to operate on more sustainable terms. This will be no easy task. Only when operating on the market for certified timber would small and medium-sized sawmills be able to benefit from a premium on sustainably produced hardwood, and they generally lack the technology and financial means to meet the standards for certified timber. Furthermore, this market is limited compared to the immense domestic market for non-certified timber. Only with donor support or through partnerships with larger firms and owners of ‘family forests’ would small and medium-sized sawmills be able to upgrade their production to more sustainable levels.

Further research should make clear under which conditions small producers are able and willing to engage in such partnerships and whether small-scale logging on smallholders’ properties can create a basis for controlled deforestation and sustainable family-based exploration schemes. This requires further insight into (i) the role of timber exploitation in the

livelihood strategies of smallholders in colonisation areas; (ii) their perception of logging and sustainable forest management of their and others' forest reserves; (iii) larger sawmill owners' perceptions of company-community partnerships aimed at sustainable family-based forest management in colonisation areas; and (iv) the economic feasibility of such partnerships.

6. Conclusions

In the Brazilian Amazon region sustainable forestry still has a long way to go. Enterprises willing to manage the forests in a sustainable manner can hardly compete with those utilising cheap timber supplies from agricultural frontier areas. The expansion of soybean cultivation and the concomitant investments in road and waterway infrastructure give a further impulse to new frontier-related logging cycles in hitherto inaccessible forest areas.

Several processes initiated in the past decade may be capable of curbing the trend, albeit on a limited scale in the short term. Firstly, the spread of worldwide concern about the loss and degradation of tropical forests generates global support for forest conservation and sustainable management. This generates funds as well as market-driven incentives for sustainable forest management at both enterprise and community level, leads to multilevel and multi-actor partnerships for forest conservation and sustainable use and helps strengthen local institutions and civil society organisations engaged in the quest for sustainable forest management.

Changing patterns in forest ownership may also lay the foundations for more sustainable forms of forest exploitation. Examples are extractive reserves for forest-dwelling communities engaged in the extraction of non-timber forest products and low-impact logging, National Forests for the sustainable production of timber on a larger scale and a greater autonomy for state and municipal governments to demarcate protected areas.

The greatest challenge is to find ways to make family-based logging and sawmilling operations in colonisation areas more sustainable. This could possibly be done through innovative company-community partnerships for the sustainable management of forest reserves that, according to legal requirements, should cover 80 per cent of the smallholders' plots. Further research should clarify whether such partnerships fit in with the livelihood strategies of smallholders in colonisation areas and the aspirations of both private forest and sawmill owners.

References

- Almeida, M.B. de (1985) 'A indústria madeireira na Amazônia'. M.A. Thesis, Universidade Federal do Paraná, Brazil.
- Bass, S. (2002) 'Global forest governance: emerging impacts of the Forest Stewardship Council and suggested research questions'. Paper presented at International SUSTRA Workshop, 9-10 December 2002, Berlin: Architecture of the Global System of Governance of Trade and Sustainable Development.
- Carvalho, G.O., Nepstad, D., McGrath, D., del Carmen Vera Diaz, M., Santilli, & M., Barros, A.C. (2002) 'Frontier expansion in the Amazon. Balancing development and sustainability', *Environment* 44(3): 34-46.
- Carvalho, R. (1999) *A Amazônia rumo ao 'Ciclo da Soja'*. Amazonia Papers 1(2). Friends of the Earth/Amigos da Terra, Programa Amazônia. URL: <http://www.amazonia.org.br>.
- Fearnside, P.M. (1997) 'Protection of mahogany: a catalytic species in the destruction of rain forests in the American tropics', *Environmental Conservation* 24(4): 303-306.
- Fearnside, P.M. (2001) 'Soybean cultivation as a threat to the environment in Brazil', *Environmental Conservation* 28(1): 23-38.
- Ferroukhi, L. (ed.) (2003) *Municipal Forest Management in Latin America*. Bogor: Centre for International Forestry Research / Ottawa: International Development Centre.
- Freitas, A. de (2003) 'Sustainable forest management in Brazil and the role of FSC forest certification'. Paper presented at the Congress on 'Globalisation, localisation and tropical forest management in the 21st century', Amsterdam, 22-23 October 2003.
- Kleinpenning, J.M.G. (1977) 'An evaluation of the Brazilian policy for the integration of the Amazon region (1964-1974)', *Tijdschrift voor Economische en Sociale Geografie* ixviii(5): 297-311.
- Kleinpenning, J.M.G. (1978) 'A further evaluation of the Brazilian policy for the integration of the Amazon region (1974-1976)', *Tijdschrift voor Economische en Sociale Geografie* ixix(1-2): 78-86.
- Grupo de Trabalho Amazônico (2002) *Pelo Futuro da Amazônia / For the Future of the Amazon*. Brasília: GTA.
- Laurence, W.F., Cochrane, M.A., Bergen, S., Fearnside, P.M., Delamônica, P., Barber, C., D'Angelo, S. & Fernandes, T. (2001a) 'Environment: the future of the Brazilian Amazon', *Science* 291: 438-439. [DOI: 10.1126/science.291.5503.438] (in Policy Forum).
- Lima, E. & Merry, F. (2003) 'Views of Brazilian producers – increasing and sustaining exports', pp. 82-105 in Macqueen, D.J. (ed.) (2003) *Growing Exports: the Brazilian Tropical Timber Industry and International Markets*. IIED Small and Medium Enterprise series No.1. London: International Institute for Environment and Development.
- Lima, E., Leite, A.A., Nepstad, D., Kalif, K., Azevedo-Ramos, C., Pereira, C., Alencar, A., Lopes Silva Jr., U. & Merry, F. (2003) *Florestas Familiares: um Impacto Sócio-ambiental entre a Indústria Madeireira e a Agricultura Familiar na Amazônia*. Instituto de Pesquisa Ambiental na Amazônia, Belém.
- Macqueen, D.J., Grieg-Gran, M., Lima, E., MacGregor, J., Merry, F., Prochnik, V., Scotland, N., Smeraldi, R. & Young, C.E.F. (2003) *Growing Exports: the Brazilian Tropical Timber Industry and International Markets*. IIED Small and Medium Enterprise series No.1. London: International Institute for Environment and Development.

- Mahar, D. (1988) *Government Policies and Deforestation in Brazil's Amazon Region*. Washington: World Bank.
- May, P.H. (2002) 'Forest certification in Brazil: trade and environmental enhancement'. Paper prepared for the Consumer Choice Council. URL: http://www.consumercouncil.org/forest/brazil_forest_english.pdf.
- Mayers, J. & Bass, S. (1999) *Policy that Works for Forests and People*. Policy That Works Series No.7: Series overview. London: International Institute for Environment and Development.
- Ministry of the Environment (2002) *Biodiversity and Forests of Brazil*. Brasilia: Ministry of the Environment.
- Nepstad, D., McGrath, D., Alencar, A., Barros, A.C., Carvalho, G., Santilli, M. & Vera Diaz, M. del C. (2002a) 'Environment: enhanced: frontier governance in Amazonia', *Science* 295: 629-631.
- Nepstad, D., Capobianco, J.P., Barros, A.C., Carvalho, G., Moutinho, P., Lopes, U. & Lefebvre, P. (2002b) *Roads in the Rainforest: Environmental Costs for the Amazon*. Belém: MGM Gráfica e Editora.
- Nepstad, D.; Azevedo- Ramos, C. & Lima, E. (2003) 'Governing the Amazon timber industry for maximum social and environmental benefits'. Paper presented at the GTZ/CIFOR International Conference on Livelihoods and Biodiversity, Bonn, Germany, 19-23 May 2003 (19 pp.).
- Pagiola, S., Bishop, J. & Landell-Mills, N. (2002) *Selling Forest Environmental Services. Market-based Mechanisms for Conservation and Development*. London: Earthscan.
- Ros-Tonen, M.A.F. (1993) *Tropical Hardwood from the Brazilian Amazon. A Study of the Timber Industry in Western Pará*. Saarbrücken/Fort Lauderdale: Verlag Breitenbach Publishers.
- Ros-Tonen, M.A.F. (2004) Report of the congress on 'Globalisation, localisation and tropical forest management in the 21st century', held in Amsterdam on 22-23 October 2003.
- Scherr, S., White, A. & Kaimowitz, D. (2003) *A New Agenda for Achieving Forest Conservation and Poverty Alleviation: Making Markets Work for Low-Income Producers*. Washington: Forest Trends / Bogor: CIFOR.
- Scholz, I. (2001) *Overexploitation or Sustainable Management: Action Patterns of the Tropical Timber Industry. The Case of Pará (Brazil) 1969-97*. GDI Book Series. London: Frank Cass Publishers.
- Scholz, I. (2003) 'Negotiating solutions for local sustainable development and the prevention of deforestation. The role of co-operation among organised civil society and public actors in the Brazilian Amazon'. Paper presented at the Congress on 'Globalisation, localisation and tropical forest management in the 21st century', Amsterdam, 22-23 October 2003.
- da Silva, M.G. (1987) 'Os trabalhadores na várzea no serviço da madeira: contradições do capital no desenvolvimento e crise do extractivismo no Vale Amazônico'. M.A. Thesis, Universidade Federal do Pará.
- Smeraldi, R. (2003) 'Expedient plunder? The new legal context for Amazonian logging', pp. 49-64 in D.J. Macqueen (ed.) *Growing exports: the Brazilian tropical timber industry and international markets*. IIED Small and Medium Enterprise series No.1. London: International Institute for Environment and Development.
- Smeraldi, R. and A. Veríssimo (1999) *Acertando o Alvo: Consumo de Madeira no Mercado Interno Brasileiro e Promoção da Certificação Florestal*. Belém: Friends of the Earth Amazon Program/ IMAZON/IMAFLORA.

- Stone, S.W. (1997) *Growth in the Timber Industry of the Eastern Amazon: Economic Trends and Implications for Policy*. PhD dissertation, Cornell University.
- Stone, S.W. (1998) 'Evolution of the timber industry along an ageing frontier: the case of Paragominas', *World Development* 26(3): 443-448.
- Tomaselli, I. (2001) 'The private sector and sustainable forest management – South America perspective'. Paper presented at the International Workshop of Experts on financing sustainable forest management, Oslo, Norway, 22-25 January 2001.
- Toni, F. (2003) 'Forest Management in Brazil's Amazonian Municipalities', pp. 145-177 in Ferroukhi, L. (ed.) *Municipal forest management in Latin America*. Bogor: Centre for International Forestry Research / Ottawa: International Development Centre.
- UNFF (2004) 'United Nations Forum on Forests. Global partnership for forests for people'. Fact Sheet 1. URL: <http://www.un.org/esa/forests/pdf/factsheet.pdf>.
- USDA/FAS (2004) 'The Amazon: Brazil's Final Soybean Frontier'. USDA Production Estimates and Crop Assessment Division, Foreign Agricultural Service. URL: http://www.fas.usda.gov/pecad/highlights/2004/01/Amazon/Amazon_soybeans.htm.
- Veríssimo, A., Cochrane, M.A., Souza Jr., C. & Salomão, R. (2002) 'Priority areas for establishing National Forests in the Brazilian Amazon', *Conservation Biology* 6(1): 4 [online]. URL: <http://www.consecol.org/vol6/iss1/art4>.
- Veríssimo, A., Lima, E. & Lentini, M. (2003) *Pólos Madeireiros do Estado do Pará*. Belém: IMAZON.
- WCFS, 1999. *Our forests – our future. Summary Report of the World Commission on Forests and Sustainable Development*. URL: <http://www.iisd.org/pdf/wcfsdsummary.pdf>
- White, A. & Martin, A. (2002) *Who Owns the World's Forests? Forest Tenure and Public Forests in Transition*. Washington: Forest Trends.
- Wiersum, K.F. (2000) 'Forest policy development between globalisation and localisation'. Paper presented at the XXI IUFRO World Congress.

Endnotes

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- ¹ The term *madeireiro* can either refer to (a) the owner of a sawmill or timber company and is generally used in this sense in southern Brazil; (b) a timber merchant who buys and resells logs and timber but is not himself engaged in wood extraction or processing; or (c) an autonomous logger who sells roundwood to traders or sawmill owners. The last meaning is the one which is used in western Pará.
- ² Browder (1986) and Uhl *et al.* (1991) who studied the timber industry in Rondônia and Eastern Pará, respectively, found that there were lumbermen who were exclusively engaged in logging and lumbermen who only transport and deliver the logs to the sawmills. This distinction was exceptional in the Santarém region. Only one sawmill in the city of Santarém occasionally made a deal with a trucker to carry logs on his way back from the Transamazônica, to where he was carrying other goods. In such a case, the trucker was, however, not regarded as a lumberman. In addition, one sawmill, operating on a large *fazenda*, worked with contract loggers, who were exclusively hired to fell trees. Although this was quite common in eastern Pará, it was an exception in the Santarém region.
- ³ Settlers are allowed to clear 3 ha of their 100 ha plot per year up to a maximum of 20 per cent of their property.
- ⁴ Smeraldi (2003) suggests that the enormous supply of legally extracted roundwood from clearings completely altered the picture as regards illegal logging. Whereas in the 1990s an estimated 80% of all roundwood

production originated from illegal clearings, the current situation is that 75% of all roundwood comes from legally approved deforestation in colonisation areas.

⁵ The G-7 comprises Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

⁶ The largest three financiers are Germany (41%), European Commission (23%), and Brazil (15%).

⁷ See <http://www.worldbank.org/rfpp> and <http://www.mma.gov.br> for background documents and further information about PPG-7).

⁸ The number provided on the IBAMA website (12 extractive reserves in the Amazon plus four marine reserves elsewhere) is lower than the total of 25 extractive reserves mentioned on the website of the Ministry for the Environment (MMA), which means that the number of extractive reserves in the Amazon might have been increased since the creation in 1998 of the youngest one mentioned on the IBAMA website, *i.e.*, the RESEX do Lago da Cuniã in Rondônia.

⁹ More experience has been acquired with enterprising partnerships in Northeast Brazil.