

## Chapter 10

# Changing Prospects for Sustainable Forestry in Brazilian Amazonia: Exploring New Trends

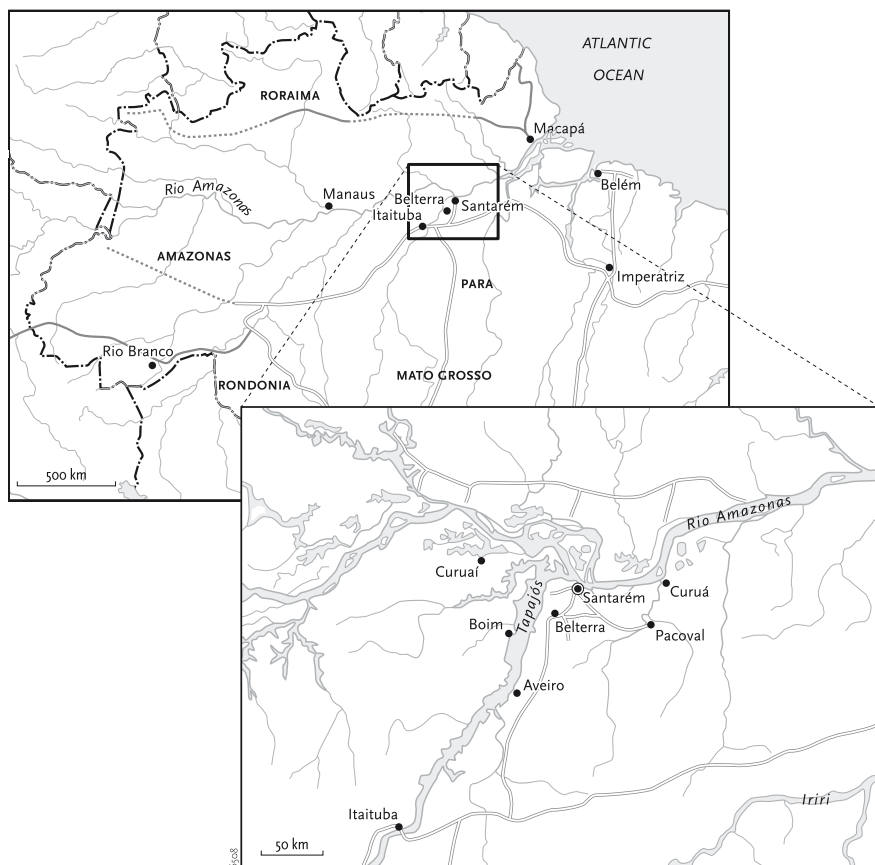
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Over the past decade, issues related to territory, local governance and globalisation have changed tropical forest management in Brazilian Amazonia. Firstly, there is a trend towards decentralised forest management, the devolution of land rights to 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 bringing about trade liberalisation, expansion of external markets for timber and soybeans, and the spread of a worldwide concern for the fate of forests. While trade liberalisation and expanding world markets may spur increased deforestation, globalising concern about the loss of the forest's ecological and livelihood services is creating new market-driven incentives for sustainable forest management and donor support to community-based forest management. The expectations regarding the outcome of these changes point to different directions. Many fear that the recent expansion of soybean cultivation and associated investments in road paving and improved waterways will further encourage deforestation and predatory logging (Carvalho 1999; Fearnside 2001). On the other hand, shifts in forest governance and market-driven incentives for sustainable forest management may signal a trend towards more sustainable practices.

Focusing on the Amazonian timber industry, this chapter explores the aforementioned trends and their implications for the prospects of developing more sustainable forestry.

### Timber Extraction and the Agricultural Frontier in the Early 1990s

In the early 1990s, we carried out a study of the features and consequences of the timber industry in the state of Pará in Brazilian Amazonia (Ros-Tonen 1993). We applied a semi-structured questionnaire with the owners, managers or other staff of 71 sawmills and timber companies in the Santarém region (Fig. 10.1) and the city of Belém. Additionally, we conducted nine open interviews with autonomous lumbermen working in the Santarém region. These lumbermen, locally



**Fig. 10.1** The Santarém region

referred to as *madeireiros* or *toreiros*, earned their living by felling, transporting and/or selling logs.

Traditionally, in times when forests were hardly accessible over land, almost all roundwood came from seasonally flooded *várzea* forests which were only accessible by river. This changed with the opening up of the Amazon region and the road building programmes initiated in the 1960s. Since then, logging in the Amazon region is intimately related with the advancement of the agricultural frontier. By the early 1990s, we estimated that 85% of all roundwood originated from upland forests in recently opened and occupied areas (Ros-Tonen 1993, p. 74). As a result, much roundwood came from tracts of forests that were being converted into farming land and pasture. We estimated that 71% of all roundwood inputs of the sawmills in the Santarém region and 49% of the total log consumption of the surveyed companies in Belém came from clearings for agricultural land uses (Ros-Tonen 1993, p. 75).

The autonomously working lumbermen played an important role in the relationship between agriculture and the timber industry. The typical lumberman of the upland forest was the owner of a logging truck and often a small piece of land, who combined logging with farming. In the early 1990s, an estimated 60–70 lumbermen were active 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 that was driven from tree to tree. Equipment was simple and consisted of a logging truck equipped with a winch and steel cables to tow the logs, a chainsaw and a machete. The tracts of forest that were logged belonged either to the lumberman himself or to small farmers who had settled along the roads and had planned to clear the forest to plant their crops. Large landholders (*fazendeiros*) usually hired labourers to do the felling, often in combination with an investment in a mobile sawmill to saw the logs. Other large landholders 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% of all logs used by the sawmills in our survey, and 42% of the sawmills depended entirely on lumbermen for their roundwood supplies (Ros-Tonen 1993, pp. 75 and 85). At that time, the organisation and high costs involved in logging operations meant that even the larger sawmills preferred to buy 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 (rubber tapper or logger) receives an advance in the form of 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 relation between timber exploitation and agriculture in settlement areas was also reflected in the technology employed. Of the sawmills that employed their own logging crew (58% of the total number surveyed) only 14% used specialised forestry equipment, such as front-end loaders, bulldozers and skidders. Forty-four percent used the so-called *catraca* system that was also used by autonomous lumbermen. In this system a simple logging truck is driven from tree to tree and the logs are directly toggled onto the truck, using the winch and steel cables with which the truck is equipped. The rest of the sawmills that had their own logging operations, 42%, used one extra machine in addition to the logging truck and chainsaw. This was usually a modified farm tractor which was also used in agriculture, equipped with hooks and steel cables to haul the logs.

Another characteristic that reflected the connection between timber exploitation and the agricultural frontier in Brazilian Amazonia was the source of roundwood: 61% of the surveyed sawmills regularly made a deal with agricultural colonists who exchanged trees for money, sawnwood, the construction of a secondary road or a

small bridge, or machine loans. Selling trees or logging rights thus provided both peasants and cattle raisers with the financial or technical means for the conversion of forests into farm land or pasture.

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, they tended to convert their forest into farmland. Most sawmill owners were agricultural colonists, for whom operating a sawmill was 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 they were the only potential actors to invest in sustainable forest management, competition from 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.

## 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; Lentini et al. 2003, 2005) largely confirm the patterns described above (Table 10.1). There is still a strong relationship between colonisation and timber exploitation, as shown by the emergence of new timber-processing centres (*polos madeireiros*) in recently opened up frontier 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) estimated that 75% of all extracted

**Table 10.1** Main features of roundwood supply in the state of Pará in the early and late 1990s

| Feature  | Source:   | Ros-Tonen<br>(1993)  | Veríssimo<br><i>et al.</i> (2003) |
|--|---|----------------------|-----------------------------------|
| Roundwood source   | <ul style="list-style-type: none"> <li>Owned by the sawmill</li> <li>Third parties</li> <li>Publicly owned areas</li> </ul> | 49%*<br>61%*<br>17%* | 36%**<br>55%**<br>9%**            |
| Proportion of wood provided to sawmills by lumbermen                               |   | 80%                  | 44%                               |
| Proportion of sawmills depending solely on lumbermen                               |   | 42%                  | 45%                               |
| Proportion of roundwood originating from clearings                                 |   | 71%                  | n.a.                              |
| Proportion of sawmills logging at low technological level ( <i>catraca</i> system) |   | 39%                  | 12%                               |

\* Proportion of sawmills; more options are possible so that total is larger than 100%.

\*\* Proportion of roundwood.

roundwood currently comes from legally approved clearings in the settlement areas, where farmers are allowed to clear 3 ha of their 100 ha plot per year up to a maximum of 20% of their property.

Moreover, little seems to have changed with respect to the tenure of the roundwood source: Veríssimo et al. found that 36% of the roundwood used in Pará in 1998 came from forest land owned by the sawmill, 55% from third parties including independent lumbermen and timber merchants, and 9% from publicly owned areas (Table 10.1).

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, p. 35) suggests a declining role for lumbermen in the Santarém region: the authors estimate that 44% of all roundwood extracted in this region in 1998 was provided by autonomous lumbermen, whereas this proportion was 80% 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 for timber extraction is even lower: here only 22% of the roundwood is provided by autonomous lumbermen, while 78% comes from the sawmills' own explorations (Veríssimo et al. 2003, p. 34). However, according to Lima and Merry (2003, p. 85) the proportion of sawmills that depend on third parties for 80–100% is still substantial: 80% of the small sawmills, 50% of the medium-sized sawmills and 25% of the large enterprises. The proportion of large enterprises depending for the most part on third parties is remarkably low compared to the 89% we found after interviewing large enterprises in Belém 10 years earlier.

For the state as a whole, an up-scaling of the machinery used in timber exploration seems to have occurred. According to the inventory by Veríssimo et al. (2003) 12% of the extracted wood in Pará is exploited using the capital extensive *catraca* system in which a logging truck is used for hauling the logs. This is low compared to what we found in our 1993 study (39% of the sawmills with own operations and all operations by lumbermen). In the Santarém region, however, 65% of the logging operations are still undertaken using the *catraca* system (Veríssimo et al. 2003, p. 35), which is high compared to the other timber zones identified in their study (ranging from 0–4% in Southern and Eastern Pará to 25% in Western Pará and 31% in the Islands region).

Smeraldi (2003, pp. 50–51) notes that two government measures in the early 1990s facilitated the import of high-quality technology. First, the Brazilian government abolished the tariffs on equipment produced outside of Brazil. Second, it adopted the Kandir Act in September 1996, which included an exemption from payment of the ICMS (*Imposto sobre a Circulação de Bens e Serviços* – a value added tax or goods and services tax) for the export of primary and semi-processed goods, the acquisition of capital goods, the use of energy, and company consumption of goods. These measures enabled the Amazonian timber industry to import skidders, trucks and other equipment previously beyond the reach of most enterprises. Although this does not seem to have changed the industry's technological level as a whole, it has had a tremendous effect on the productivity and efficiency of timber companies and the quantities they exported. With regard to the efficiency of the timber industry, Lentini et al. (2005, p. 62) confirm that the average wood-processing efficiency increased from 38% to 42% between 1998 and 2004.

## Expansion of Soybean Cultivation as a Catalyst for Predatory Logging

The relationship between logging and agricultural development at the agricultural frontier received a new impulse in the last decade following the expansion of soybean cultivation. Soybean cultivation in Brazil nearly doubled in the past decade from 11.7 million hectares in 1994 to 22.9 million hectares in 2005, of which 30% (7 million hectares) is being cultivated in the Legal Amazon<sup>1</sup> (USDA/FAS 2004, 2005). It was driven by a booming world demand, which rose by 52% between 1994 and 2004 (USDA/FAS 2004). 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).

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 billion 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 (Laurance et al., 2001). It is expected that the 6,245 km of paved highways planned under this programme will nearly double the forest area available to loggers, opening up hitherto inaccessible areas (Carvalho et al. 2002). Studies by Nepstad et al. (2002a,b) and Carvalho et al. (2002) indicate that the expansion and paving of the road network will further stimulate logging activities because of lower transportation costs, which will make the exploitation of a greater number of species profitable. The newly paved roads will also allow for larger volumes to be transported. These effects taken together make the above-mentioned authors believe that an intensification of logging is likely to occur in the zones within 50 km adjacent to the improved roads (Nepstad et al., 2002a,b; Carvalho et al. 2002). In Novo Progresso along the Santarém-Cuiabá (BR-163), for example, the number of sawmills had already 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 areas around the

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<sup>1</sup>The Legal Amazon comprises the entire states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima and Tocantins and part of the state of Maranhão (east of the 44° W meridian).

Santarém-Cuiabá Highway are 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.

It should be noted that in tropical rain forest areas, in contrast to the savannah areas, the relationship between the expansion of soybean cultivation and deforestation 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 intense fertilisation with lime than the more acid forest soils. Consequently, many small landholders have been expelled from their lands because of advancing soybean plantations (Carvalho 1999). These displaced farmers face the choice of migrating to nearby cities or moving deeper into the forest where they clear new land. If they choose for the latter, the model of colonisation-related logging and sawmilling described above is reproduced in the new frontier areas.

## **Recent Changes that May Curb the Predatory Trends**

The above suggests that little has changed in roundwood supply patterns and that the infrastructural changes following the expansion of soybean cultivation will only perpetuate and strengthen predatory exploitation forms. There are, however, several trends with potentially positive effects on the prospects for sustainable forest management: (i) increasing scarcity of timber in the most accessible areas, (ii) new market and donor-driven incentives for sustainable industrial and community-based forest management, and (iii) decentralisation of forest management and devolution of forest land to local communities and forest users.

### ***Increasing Scarcity of Roundwood Resources***

It has been argued that increasing wood scarcity could serve as an incentive to increase investments in sustainable forest management, at least for large timber companies (Stone 1997, 1998). For smaller sawmills this is unlikely to occur. Sawmilling in the Amazon is a highly mobile activity, following the dynamics of the agricultural frontier as long as roundwood is supplied from clearings of virgin forest for agriculture. In recently opened up settlement areas, the sawmills are run until the roundwood supplies in the direct vicinity are depleted (Scholz 2001). The machines are then sold and their former owners focus on farming again. This process is illustrated by the recent establishment of most sawmills: in 1989 about half of the surveyed sawmills were less than 5 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% in the Islands region, to 53% in the older frontier areas and 100% in the new frontier areas in Western Pará).



The sawmills are more mobile than their owners: our survey in 1989 indicated that 71% of the sawmills along the Transamazônica were bought second-hand after having been in service for one or more previous owners at different locations for many years.

Studies carried out by Stone (1997, 1998) reveal the economic dynamics of this relocation process in situations of increasing timber scarcity. He used an adapted version of the eighteenth century Von Thünen location model to analyse the dynamics of the timber industry along an ageing frontier. He found that the distance to markets, level of transportation costs, net timber prices and degree of certainty about property rights affected 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 forest land by investing in larger trucks (to bridge larger distances and reduce transportation costs) and advanced technologies (to reap the benefits of economies of scale). When scarcity increases further, the sawmills are confronted with the choice either to re-invest in forest management (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, calling for subsidies and changes to the forest statute. She expects little investment 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 more plausible 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 exploitable timber in a particular location becomes scarce.

### ***Market and Donor-driven Incentives for Sustainable Forest Management***

It has often been feared that economic globalisation would pose a threat to tropical forests. It would do so by opening up markets and boosting international demand for legally and illegally logged hardwood and other tropical forest products. In light of recent developments in soybean cultivation, the opponents of globalisation appear to be in the right. There is, however, another side to the matter, as the same process of globalisation is spreading worldwide concern about the loss and degradation of tropical forests and their global ecological services such as maintaining biodiversity, carbon sequestration and watershed protection. An increasing number of international forest-related conventions and agreements have emerged to protect both these global values and those at the local livelihood level such as the supply of food, medicines, timber and fuelwood, and recreational, religious and spiritual functions (Bass 2002).



Although Brazil has always stressed that the development and conservation of its forests is a matter of national jurisdiction, it has nonetheless linked up with the trend towards global forest governance (referred to as the International Forest Policy Dialogue). It has developed its National Forest Programme with the aim of promoting sustainable forest development (Ministry of the Environment 2002) and implementing both the (non-binding) Forest Principles and Chapter 11 on Combating Deforestation of Agenda 21, both adopted at the United Nations Conference on the Environment and Development (UNCED or Rio-92). It was also one of the eight countries taking the initiative to develop the United Nations Forum on Forests (UNFF) which was created to provide a more permanent home for the International Forest Policy Dialogue and a platform for exchanging experiences among governments and other stakeholders in sustainable forest management. However, most international agreements and processes have probably had little impact on how the Amazon forest is being managed in practice. Greater influence seems to come from three other initiatives and processes that emerged or gained ground in the 1990s:

- The Group of Seven<sup>2</sup> most industrialised countries' initiative to set up the Pilot Programme to Conserve the Brazilian Rain Forests (PPG-7);
- The creation of niche markets for environmental services like biodiversity conservation, carbon sequestration and watershed protection and for sustainably produced timber and non-timber forest products, particularly from certified operations;
- The emergence of global-local partnerships for forest conservation and sustainable forest use.

### ***The Pilot Programme to Conserve the Brazilian Rain Forests (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 to promote the conservation and sustainable use of tropical rain forest resources and to reduce deforestation and CO<sub>2</sub> emission rates. Apart from the G-7 countries, funding comes from the European Union, the Netherlands, and Brazil itself, totalling about US\$ 340 million. 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 with and participation of these organisations in Brazilian public administration (Scholz 2005). Among other activities, the PPG-7 has provided institutional support to the *Grupo de Trabalho Amazônico* (GTA), a network of 602 environmental, community-based

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<sup>2</sup>The G-7 comprises of Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

and other civil society organisations in the Amazon region, which now plays a decisive role in policy and decision-making with regard to the region's development. Moreover, community-based forest management schemes have received an impulse from a part of the PPG-7 programme known as 'Demonstration Projects'. Between 1995 and 2004, the Demonstration Projects under PPG-7 have supported 194 community-based projects (147 in the Amazon region and 47 in the Atlantic Forest region), with an average grant of US\$ 113,607 each.<sup>3</sup>

### Market-based Instruments

Another globalisation-related trend that might change forest management practices is the creation of market-based instruments for sustainable forest management. Part of these incentives, such as the trade in environmental services, are aimed at maintaining ecological values such as biodiversity and habitat (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, are aimed at improving forest management practices so that forest products are produced in an ecologically sustainable, economically viable and socially equitable manner.

Consumer pressure has created a demand for sustainably produced timber and certificates testifying that forest products come from sustainably managed sources. With support from the German agency for international cooperation, GTZ, and the World Wide Fund for Nature, WWF-Brazil, 18 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, FSC officially recognised the working group as an FSC National Initiative, and standards for Amazon upland forest management became official in 2002. Since then, the area of native forest has rapidly expanded. According to Lentini et al. (2005, p. 86) there were 22 certified forestry operations in the Amazon region in May 2005. Twelve of these were run by private enterprises, seven were community-based management schemes and three were private plantations of teak (*Tectona grandis*) and eucalypt (*Eucalyptus* sp.). Together, these projects cover an area of about 1,200,000 ha of native forest and 444,000 ha of plantations. In 2003, the certified projects were responsible for approximately 1.5% of the wood produced in the Brazilian Amazon (Freitas 2003). Although these developments 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).

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<sup>3</sup> See <http://www.worldbank.org/rfpp> and <http://www.mma.gov.br> for background documents and further information about PPG-7.

### **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 has resulted in new forums for stakeholder negotiations, partnerships, alliances and joint actions for the conservation and sustainable management of forests. At the 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 local communities (Ros-Tonen 2007).

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 (*Manejo Florestal e Prestação de Serviços*; Forest Management and Services). MAFLOPS 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. 2005). The project aims to achieve this by supporting the smallholders in regularising property rights over community and ‘family forests’ (i.e. the 50–80% of the property that according to the Brazilian Forestry Code is to remain under forest cover) and drawing up management plans for these forest areas. There are also close links between national and international research organisations, which are strongly influencing Brazilian forest and development policies for the Amazon region. Examples are the Man and Environment Institute for the Amazon (IMAZON), which has historical links with Pennsylvania State University and the Institute for Environmental Research (IPAM), with substantial involvement of researchers from the Woods Hole Research Centre. 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 a scientific basis for ecologically sustainable, economically viable and socially responsible forestry.

### ***Decentralisation and Devolution***

There is a discernible trend worldwide towards decentralised forest management and the devolution of land rights to local communities, which is changing the type of actors involved in forest management. First, there is a trend towards decentralisation of forest management from the central (federal) government to state and municipal level. In a comparative study on municipal forest management

in Latin America, Ferroukhi (2003) notes that Brazil's municipal governments have gained considerable autonomy in education and health since the Constitution of 1988 – to an extent that compares favourably with the situation in five other Latin American countries – but that 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 regulations on forest use and management. This trend towards decentralisation is also reflected in the new Law on Public Forest Management (Law No. 11,284 of 2 March 2006), in which the establishment of regulations for the decentralisation of forest management is one of the four central elements.

A second trend towards decentralised forest management, laid down in the new Public Forest Management Law of March 2006, is the creation of National, State and Municipal forests for the sustainable production of timber and non-timber forest products and maintenance of ecological services. Currently, National Forests (*Florestais Nacionais* or 'Flonas') comprise less than 2% of the Brazilian Amazon (83,000 km<sup>2</sup>), but the Brazilian government intends to expand the area of National, State and Municipal forests in the Amazon region to a total of 50 million ha by 2010 (Ministry of the Environment 2002). In this way, the government hopes to stimulate the sustainable use of natural and plantation forests and to curb the current boom-and-bust cycle of illegal and predatory logging operations and forest burnings. Thus far, experiences with sustainable logging operations in National Forests are limited to some public–private partnership experiments in the National Tapajós Forest in the Santarém region. As long as sustainably produced timber has to compete with supplies of cheap hardwood from nearby settlement areas, it is to be expected that timber production in National Forests 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.

Third there is the trend towards devolution of forest land to local communities and forest users. White and Martin (2002) calculated that 22% of the forest land in the 18 countries with the largest forest cover falls under either private or public community or indigenous ownership. This means that the share of community ownership has doubled in 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. Although the portion of forest land under community ownership in Brazil is lower than the proportion indicated above (i.e. 13%), in the Amazon region 21% of the land is indigenous territory (Lentini et al. 2005, p.33) and 0.7% is covered by extractive reserves.<sup>4</sup> Extractive reserves are tracts of land reserved for

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<sup>4</sup>Calculation based on data on the website of the Brazilian Ministry of the Environment (URL: <http://www.mma.gov.br>).

forest-dwelling communities to sustainably exploit the forests for rubber, Brazil nuts and other forest products, while being protected from encroachment by farmers and loggers. The possibility to demarcate extractive reserves was created in federal law in 1990 (Decree No. 98,897). Until 2006, 12 extractive reserves had been created in the Amazon region, covering 3.3 million hectare and involving 22,362 people.<sup>5</sup>

## Discussion: Prospects for Forest Management

Based on the above findings, we expect that only large and/or specialised companies which have the means to invest in advanced technologies, natural forest management and plantations, and which are capable of meeting the quality standards of European and American consumers, will be able to serve the international market with certified timber. With increasing timber scarcity near urban centres and the most accessible areas and growing consumer pressure to produce in ecologically sound and socially acceptable ways, 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 quality standards of the export market. They are set up, are operational for a few years and close or relocate following the dynamics of the agricultural frontiers and infrastructural investments. A crucial factor for the prospects for sustainable forestry in Brazilian Amazonia is whether these small-scale producers will be able to play a role in the sustainable production of timber.

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, such as MAFLOPS described by Lima et al. (2003). The authors point to the mutual benefits of deals between sawmills and colonists: sawmills have access to cheap and legal timber supplies from areas already opened up by roads, while colonists get help with the legally required forest management plan and receive money and/or other benefits such as transportation by logging trucks. However, the ones who usually benefit most from conventional timber deals are the sawmills (Lima et al. 2003, p. 84). The prices paid to the colonists are up to ten times below market value, the payments are often delayed, and other benefits such as transport with logging trucks are mostly of a temporary nature (as long as their area is being logged). Furthermore, the colonists have little say in which species and what volumes are exploited and what kind of techniques are used (Lima et al. 2003, 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.

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<sup>5</sup>URL: <http://www.ibama.gov.br>

This would also fit the aim of the National Forest Programme to have an area of 20 million hectares in private properties in the Amazon under sustainable forest management through ‘enterprising partnerships’ (*parcerias empreendedoras*) by 2010 (Ministry of the Environment 2002, p. 65). It would be worthwhile investigating the feasibility of this concept and the receptivity towards it among sawmills and colonists.

It should be taken into account that smallholders in settlement 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. Small and medium-sized sawmills would only be able to benefit from a premium on sustainably produced hardwood if they operated on the market for certified timber, but 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 attempt at finding out 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 sustainable family-based exploration schemes. This requires further insight into (i) the role of timber exploitation in the livelihood strategies of smallholders in settlement areas; (ii) their perception of logging and sustainable forest management of their own and others’ forest reserves; (iii) larger sawmill owners’ perceptions of company-community partnerships aimed at sustainable family-based forest management in settlement areas; and (iv) the economic viability of such partnerships.

## Conclusions

The intimate relationship between timber exploitation and the advancement of the agricultural frontier in Brazilian Amazonia seriously impedes sustainable forestry. Enterprises able and willing to manage the forests in a sustainable manner can hardly compete with those supplying cheap timber from agricultural frontier areas. Additionally, the expansion of soybean cultivation and the concomitant investments in road and waterway infrastructure are giving 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 this trend, albeit on a limited scale in the short term. Firstly, the spread of worldwide concern about the loss and degradation of tropical forests is generating global support for forest conservation and sustainable management. This worldwide concern 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 forest use, and helps strengthen local institutions and civil society organisations engaged in the quest for sustainable forest management.

Decentralisation of forest management and devolution of forest land to local communities and forest users may also lay the foundations for more sustainable forms of forest exploitation. Examples are the greater autonomy for state and municipal governments to demarcate protected areas and National, State and Municipal Forests for the sustainable production of timber at enterprise and community level. Extractive reserves for forest-dwelling communities engaged in the extraction of non-timber forest products and low-impact logging constitute another example.

The greatest challenge is to find ways to make family-based logging and sawmilling operations in settlement areas more sustainable. This could be done through innovative company-community partnerships for the sustainable management of forest reserves that, according to legal requirements, should cover 50–80% of the smallholders' plots. We suggest that further research investigate whether such partnerships fit in with the livelihood strategies of smallholders in settlement areas, and with the aspirations of private forest and sawmill owners.